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THE TEACHING
OF
GEOGRAPHY

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THE TEACHING
OF
GEOGRAPHY

BY

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GENERAL EDITOR'S PREFACE

RECENT years have witnessed a remarkable activity in the educational world, and everywhere we meet with a great effort to make our schools more efficient. Not the least active of the various bodies who are working to achieve this greater efficiency are the teachers themselves. In all the various schools we find teachers eager to keep abreast with the times and striving hard to make themselves more perfect in their particular work. The teaching of the various subjects in the curriculum is engaging the attention of various specialist-teachers, and, as a result, great changes both in curriculum and in methods of teaching are taking place. The self-complacency of the old schoolmaster is vanishing. The place of each separate subject in the curriculum has to be justified. Attempts are being made to find more rational and more scientific reasons than mere tradition for the order in which, and the methods by which, the various parts of a subject should be taught, what parts should be included or omitted and the grounds for their inclusion or omission.

As a result there is a growing desire on the part of teachers, especially the young teachers, to acquaint themselves with the results of these various attempts, and to get information which will be of real assistance to them in their work in the class-room. The present series is intended to meet this demand. The various volumes which will appear in the series of *Cambridge Handbooks for Teachers* will be written by experienced teachers, each of whom has for a considerable time been working out the problem how his particular subject can best be taught, and each of whom has tested his theories by practical application in the class-room. Each volume will deal with the scope and purpose of its particular subject, the curriculum, schemes of work, method, equipment and reference-books, in fact with everything which may be helpful to the teachers and assist them in teaching their subjects intelligently.

S. S. F. FLETCHER.

January 1915.

AUTHOR'S PREFACE

A HANDBOOK for Teachers should contain ideal as well as practical elements. In teaching geography the balance between the ideal and the practical is difficult to maintain, for the enthusiasm of the moment, whether due to a great geographic achievement such as the conquest of the South Pole or to an outbreak of war, is apt to divert the teacher from his ideal plan. The teacher's ideal will, further, develop, and his schemes of to-day will be improved to become the schemes of to-morrow; and, finally, his ideal plan will be more comprehensive than his actual practice. Hence, in the following pages, an attempt has been made to afford practical guidance to teachers by presenting the fruits of many years' experience and to demonstrate an ideal scheme which will serve as a criterion by which to judge, first, the advisability of the proposed course of lessons for next term and, secondly, the value of the lessons given last term.

No more than a general acknowledgement can here be made of the sources of the ideas and plans suggested in this book, for they have, as a rule, been modified as a result of experiment in the class-room; it will, probably, suffice to hope that by affording them greater publicity I have paid my debt to all those from whom

I have learned. Such suggestions as are new have been tested by experience.

I have to thank Messrs Macmillan and Co., Ltd. for permission to use Figs. 2, 3, 4, 5 and 8 from my textbooks of geography and Fig. 10 from *The School World*; the Royal Geographical Society and the Scottish Royal Geographical Society for the use of Figs. 6 and 7 from articles published in *The Geographical Journal* and *The Scottish Geographical Magazine* respectively.

B. C. WALLIS.

January 1915.

The call for a reprint of this book gives me an opportunity to make several minor corrections and to add a few paragraphs upon matters which have provoked criticism. In this connection acknowledgment may well be made of the suggestive nature of the criticisms due to Mr G. G. Chisholm in *The Scottish Geographical Magazine* for August, 1915, to which I was able to reply at some length in the same magazine in October 1915.

B. C. W.

October 1915.

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CHAPTER I

THE SCOPE OF SCHOOL GEOGRAPHY

The science of Geography. No subject has greater claims upon the teacher than Geography. No subject has need of such careful teaching, such thorough equipment and so adequate a share of school time. No informative subject is so important, nor so real, nor so comprehensive.

The science of geography deals with the sum total of human effort in relation to the environment in which human life is passed; school geography includes as complete a treatment of the science as opportunity and the limits of time permit.

Geography is so comprehensive that no branch of human activity is without a geographical significance. An interesting example of the interaction between human endeavour and environment occurs in connection with the teaching of the geography of the home country. In the United States the geography of the home country is the main vehicle for lessons on patriotism and good citizenship. In view of the fact that the United States are almost a self-contained community, the American teachers naturally emphasise the interdependence of men by reference to the bonds which link east with west, north with south; we, surrounded by evidences of Britain's world-trade, take either an Imperial or a world unit, and study the interdependence of Englishmen and Germans, and the dependence of both upon Americans. We consider world facts as fundamental; they use them as additional illustrations of home phenomena. The known world is the province of the geographer, and the complete work of man provides the material for his study.

The necessity for selection. Faced with the difficulty inherent in the teaching of a subject of this magnitude, the teacher is compelled to select from the geographical content sufficient facts to exemplify the particularly geographical argument, and to formulate the habit of mind which is essentially geographical.

The teacher should choose from the facts of geology enough material for a discussion of the geological environment of man as well as man's reaction to that environment; that branch of earth knowledge, which narrates the ways in which rivers grow and lakes are formed, may possess an invincible attraction for the teacher, but for his pupils in the geography class the essential matter is not these interesting processes themselves, but the effect such processes have had upon human life. The controversy as to the formation of fiord coast-lines may attract him as a student, but for his pupils the predominant questions are fiords as factors in developing the life of man upon the earth, fiords as the home of a fishing population, as the cradle of a seafaring people, as harbours for ships. Having indicated where fiords occur, it becomes his duty as a teacher to show that fiords under circumstances such as occur in Norway serve all these purposes, but that under other circumstances, as in the case of New Zealand, fiords have only a remote connection with the life of man. He is interested, for instance, in showing to his pupils why the fiord coast of north-west Scotland is not notable for any ports of great magnitude, while the firths in other parts of that country are important for such ports as Dundee and Leith.

Similarly, in his treatment of coal. No commodity exercises so potent an influence upon the work of the world and the prosperity of its millions of inhabitants. In school, however, interest centres upon collieries rather than upon coal, and limits of time should prevent the teacher from straying from the realm of geography into other branches of knowledge. Under present circumstances, with the state of human knowledge limited as it is at the moment, the geologist does not provide the geographer with a touchstone under which the whole of our knowledge of the distribution of coal appears simple and self-explanatory. The geologist does not provide an argument which would enable a schoolboy to deduce the fact that coal or gold or any valuable mineral must of necessity occur in a certain district. The occurrence of minerals is a fortuitous accident, and the teacher of geography commences with a set of isolated facts. These facts relate not to the geological distribution of coal fields or gold deposits, but to the circumstance that here in one place man mines coal and there in another place man mines gold.

It is not a matter for the adolescent geographer that coal deposits represent "fossil sunshine" or occur in places where, in the dim vistas of geological past, forests of tropical luxuriance flourished. Such facts or fancies are not essentially geographical and their place in school geography is merely as statements which may awaken interest in our pupils because the child is full of wonderment. They should be strictly subordinated to their position as ornamental side issues.

School geography is only gradually weaning itself from the much extraneous matter with which it has been obscured. The wonderful story of man's work in various portions of the world is in itself sufficiently thrilling to hold the attention, but the teachers of a past generation missed this element of interest and attempted to teach a mass of facts which were without coherent interest and which were therefore indigestible and, consequently, they added extraneous tit-bits as spices to make them more palatable.

These illustrations will serve to emphasise a main factor in the scope of school geography. Certain facts are known regarding the inanimate world, knowledge of these facts is summarised and recorded by convenient means, which frequently take the form of maps or diagrams ; men are affected consciously and unconsciously by these facts and these effects are the subject-matter of geographical study. Whenever the facts are incapable of treatment under a comprehensive formula they must be discussed in their isolation, and it becomes a matter of small importance, for instance, that coal deposits cover a large area unless men are at work mining for the coal.

Topographical information. Consequently, the modern teacher is not interested in topographical knowledge as such. His work does not aim at providing his pupils with a memorised acquaintance with the names of the capes or bays of even the home land.

Beachy Head acquires importance since it marks the seaward face of a ridge in the South Downs and interrupts the coastal line of easy communication along the shore of the English Channel, but Ardnamurchan Point lacks such importance and may be ignored. On the other hand, the teacher should show his pupils how to find out facts regarding Ardnamurchan Point, when they have need of such information. Continuous practice in the use of the index to the atlas and of a gazetteer should form part of each child's training in geographical habits.

The world's workers. These preliminary considerations make it clear that the main part of geographical teaching lies in building up a gradually formed but steadily enlarged conception of the world's workers and the work they do. The child should ever have in mind the background of the whole world, his unit of thought should be the world as a whole rather than this, that, or the other, country.

This idea of the world should moreover be gained in constant relation to a second notion: the world as the home of man. Parts of the world where few men live are unimportant. The child should gradually obtain some notion of geographical perspective.

It will be useful during this building process for the teacher to tell the story of parts of the world as the abode of certain famous races of men in the past, so that the child may obtain some grasp of chronological perspective at the same time as he gains that grasp of the spatial perspective which is typically geographical.

Finally, the world, as the home of man, is not of equal importance throughout: certain groups of men are relatively insignificant. The criterion of importance is interest in others: certain groups of men are self-centred and self-sufficing: the nomad steppe dwellers, the majority of the people of India, a large proportion of the inhabitants of Africa, form communities each of which tends to be sufficient unto itself.

Such people are geographically unimportant. The anthropologist finds such communities of greater value than those of Western Europe; for example, the bushmen of Australia have for him great significance in connection with the story of the growth of civilisation; but the teacher of geography should be cautious not to stray into by-paths of anthropology. The wonder element is so predominant in every child and in many adults, that a fictitious interest frequently attaches to the study in the geography class-room of the native races of the world. In fine, only briefly, and on one consideration, is it possible to include accounts of such people in the geographical story. This consideration lies in the fact that it is possible by a choice of specimen races to tell the story of the growth of civilised man, to trace the development of the world's work from the primitive hunting stage through stages of pastoral and agricultural life to the life of man in Western Europe thirty years ago. Such a story will bring the pupil quickly to the threshold of modern geography and will help to emphasise his sense of the unity of the world; but the tale should be briefly told, and should serve, by way of contrast, as a means of heightening the effect of the later, more detailed, story of the world's workers at work to-day.

From this point of view the comparative handful of people who inhabit New Zealand acquires an ultimate importance out of all proportion to their numbers, and the one million people of those islands are relatively more significant than many millions of the inhabitants of India, or the millions of blacks in Africa. The New Zealander is conscious of his destiny, the African is led willy-nilly to achieve the white man's purposes by force of circumstance.

History. This point of view, that school geography should tell the story of the world's workers, and should place into geographical perspective the relative importance of various communities, provides a criterion by which to measure the importance of the historical story of the growth of nations in the geography lesson.

A keen interest in anthropology, which is a study for adults, should not lead the teacher away from his main theme; likewise a keen interest in history, which is a companion adult study to anthropology, must not attract the teacher into by-paths of a historical kind. The historical story of the growth of nations from the beginnings in Mesopotamia through the gradual development which occurred as the centre of civilisation moved westward, becomes of importance in the geographical class-room only as a means of developing one aspect of the world story. The existing world is the result of progressive changes in the "known world" throughout the historical past.

But danger lurks in too keen a devotion to the historical outlook, historical perspective differs essentially from that of geography; the one emphasises greatly the importance of the Mediterranean lands, the other tends to let such lands fall back into a dimmer perspective; the one would lay special stress on the Balkan Peninsula, for example, the other would hold the Argentine to be of greater value than Balkania.

The historical story of the past should live in the child mind in relation to a geographical setting, the geographical story of the present should stand out clear and sharp in relation to a historical background.

The cultural value of geography. From the teacher's point of view geography gains in definiteness by such limitations, and such a gain is attained without any loss of cultural value. Width of outlook, depth of insight, clearness of sympathy, are all cultivated by geographical studies. Man's work is sufficiently wide-spread, his reaction to various environments sufficiently diverse, and his varying character so easily demonstrable as to make the geographical story as convenient a means for developing cultured habits of thought as any subject which is found in a school curriculum. At the same time, geography provides material for the exercise of the power of generalisation which is characteristic of the most highly developed minds. The facts which have some geographical significance are so numerous that the learner must perforce group them, sift them, and analyse their significance; he must approach them with some test, and the mental experience which he undergoes is of great cultural value.

The facts and theories of physical science are brought before his notice, not as facts in isolation and apart from the life of man, but in their relation to human effort. The pupil may discover in the laboratory that bodies expand on heating or that wet air tends to deposit moisture on cooling; but in relation to human labours these facts acquire a new importance and a new interest, they serve respectively as a means of explaining the formation of soil, or the cause of rainfall, and they further serve as a touchstone to elucidate the geographical problems why soil occurs in thin useless patches in one district, and why rainfall is abundant in one place and absent from another. They manifest the control of human development and progress exerted by the fertility of the ground in the prairie or by the desert conditions of such lands as the Sahara. The teacher of geography regards these facts as basic material for his study, but the science teacher usually considers such facts as ultimate aims at a certain stage in his teaching.

The teacher of geography and his colleagues. Such illustrations serve to emphasise the attitude of the teacher of geography to some of his colleagues. He requires the results of their teaching as the bricks from which to build his superstructure, and if his colleagues do not supply the bricks, then he has to obtain them elsewhere; as a last resort it becomes his duty to state such facts without any demonstration of their validity, he has, as it were, to dump these bricks down before his class.

Consider, for example, his attitude with regard to the colleague who teaches mathematics. The mathematical fact which underlies much geographical teaching relates to the conditions under which triangles are similar. His mathematical colleague reaches similarity of figures and solids late in the mathematical course, the geographer cannot wait until this late period, and must resort to intuitive perceptions regarding similarity on which to base his work.

As a rule the teacher of geography begins his labours where his colleagues conclude theirs; and he should refrain from attempting to do the work in which his colleagues specialise when he finds that their courses do not fit his. In life, the child is constrained to accept without explanation many facts which are set before his intelligence, he receives them and arrives at a fuller appreciation of their significance with the lapse of time; so it is in the teaching of geography: the teacher quotes such a fact, his pupils ask why such a fact is true, the teacher explains the fact with the brevity and lack of detail with which a parent frequently answers the tantalising questions of his offspring. The pupils still fail to grasp the explanation and persist in the inquiry. The teacher then, because his time is limited, suggests means whereby a boy may investigate the matter for himself or disposes of the whole series of questions by the statement—that when the boy is older, perhaps, when he reaches the next form in his career through the school, he will understand the matter.

Scientific habits. But the teacher of geography who introduces his pupils to a scientific study has another duty beyond that of selecting the subject-matter which he shall teach. He must train his pupils in habits of thought and expression in sympathy with the nomenclature and methods whereby the adult geographer expresses the truths of the science, and with the materials which are used in demonstrations of the validity of geographical truth. In other words, a large portion of the time of the teacher is necessarily occupied with maps, diagrams, quantities, pictures and other forms of what may be called geographical shorthand.

The child must receive an adequate training in map-reading, and this training is best received during a course of map-making. But due caution is again necessary in this regard: the teacher of geography is not required to produce cartographers, nor is he constrained to train meteorologists or statisticians. The child should make maps by means of plane-table exercises, or after more elaborate surveys: he should read meteorological instruments and draw isotherms: he should study tables of quantitative information and make distribution maps: but, once he understands such maps, once he appreciates the meanings and the limitations of contour lines, of isotherms, and of the shading or colour of a distribution map, then the need for the construction of such maps as an exercise in geographical shorthand has vanished, and no other maps of such a kind should be made except in a duly subordinated way as a means of expressing the geographical facts which emerge from a geographical study upon which the pupil is engaged. At first, the main feature of such map-making is the actual process of construction, but gradually the pupil should come to regard his own efforts in such a direction merely as supplements to the efforts of the professional cartographer whose works he may procure at a shop. He should then make maps only when he cannot obtain from outside sources those which he needs.

A dual aim. In conclusion, the teacher of geography has a twofold aim. His pupils must acquire an outlook upon the whole world as the home of man, and at the same time they must obtain a dexterity in the interpretation of geographical records. Their outlook must be in due perspective, with some feeling for gradation in the relative importance of various areas; and their dexterity must be that of knowing how a thing is done rather than a manual ability to do the thing oneself.

The pupil must know a certain number of facts, because isolated facts form his starting-point, but the more important knowledge is that of generalisations; the pupil must be able to group together connected facts: such grouping does not take the usual form of cause and consequence, but the rarer form of inter-related items of which each tends to control the others. Geographical science is not mainly a science of actions and results, but rather of interactions and connections, and the complete story is progressive, since one set of conditions modifies a second, which in turn modifies others, which in their turn alter the determinant conditions which are first considered.

The teacher of geography should be conscious of a definite restraint in regard to the subject-matter of his course. As a teacher of geography it becomes his duty to subordinate his adult enthusiasm for one or another branch of learning which has definitely geographical relationships, so that he never loses sight of the geographical goal at which he aims. He must not overload his course with extraneous matter.

Finally, he must collate his geographical teaching, so far as he can, with the work of his colleagues, but this consideration should not prevent him from using as a foundation for his work facts which his colleagues will explain at a later time in the pupil's career. The pupil must accept as a fundamental piece of information, which wiser people than he have discovered, the fact which is quoted to him: adequate appreciation must follow the enunciation of the fact. Such a method contravenes the principle usually associated with the term *heuristic,* but it has the excuse that it is the kind of experience which is met with in later life, and in this sense such a practice may be advisable as a mental discipline for the pupil.

For breadth of outlook, for intimate relation with the palpitating human life which surrounds the pupil, for an insight into the wonder-world of inanimate and animate objects, no school subject can compete with geography: and it rests with the teacher to make the reaction between his intelligence and that of his pupils a continuous stimulus towards the wide sympathies, the broad grasp, and the intensity of appreciation of detail which are characteristic of a well-developed mind.

CHAPTER II

DESCRIPTIVE GEOGRAPHY

Story-telling. The term descriptive geography is here used to designate the key-note of the earliest attempts at instruction in geography. From the veriest beginnings when the child listens with absorbed interest to stories of the fairy tale type, which have the advantage that they refer to real people in a real world, to the more mature days when the child is in one of the lower forms of a secondary school, the main work of the geography teacher will be descriptive.

The true function of the teacher, however, appears even at this early stage ; it is his business to select the story which is to be told, and it becomes his business to introduce the globe as a model of the earth just so soon as the children feel the necessity of some means of separating the regions to which one set of stories attach from those to which another set give a different conception, and, also, just so soon as the children have become acquainted from their toys with the notion of similar solids, the doll as a model of a person, the toy boat as a model of the big ship, and so on. It is moreover his business to see that the first stories introduce the personal element, and that in time the personal element is diminished. At first the story will be told of persons who are named, but later a multiplicity of named people may be introduced so that in the end the country becomes more important than the named traveller. An illustration of the importance in the early stages of the name of the traveller occurs in Sven Hedin's book *From Pole to Pole* ; the beginning of the book tells Hedin's own story, but the lands which he did not visit are introduced to the reader under the supposition that they were visited by another named person. This book is of surpassing interest to children below the school age, one precocious boy to whom an indulgent father read the book completely floored his parent during a discussion as to the reason why the Chinese built the Great Wall. On receipt of the explanation that the wall was intended to keep out the enemies of the Chinese, the boy retorted : "But, father, the enemies could get over the wall. Sven Hedin says so."

First lessons. When the child first begins attendance at school, it may be assumed that he has heard some stories about people in other parts of the world, that he knows that England is a place much larger than the town in which he lives, and that there is something larger still, which he knows as the world. What he knows of the parts of the world will be haphazard, scanty here and fuller there, and it becomes the first business of the teacher to relate a succession of stories which will tend to give some notion of order to the pupil's comparatively hazy ideas. For this purpose it is suggested that the story of the exploration of the world should be woven round the names of a few of the famous travellers and explorers. Livingstone, Mungo Park, Daniel Boone, Champlain, Marco Polo, John Davis, and Columbus are but a few of the names which suggest themselves. Such stories should be brought within our own times by a recital of the exploits of Nansen, Peary, Scott, and Amundsen in one part of the world, and by the story of a modern traveller's experiences in such a district as the Amazon valley in another totally different part of the world. The child should be so stimulated by such stories that he builds mental images of life in other lands, and the teacher will be rewarded for his efforts when he finds that the child regards Park or Boone or Scott as heroes about whom he would like to hear other stories. If the mention of the name conjures gleaming eyes and stirring pulses in his class, then his pupils have grasped the essential purpose for which the stories have been told.

Broad contrasts will be a feature of this set of stories, and to elucidate these narratives the globe can be introduced. A plain black globe with the land shown in white will suffice: the names, Livingstone's country, Columbus's sea, etc., should be inserted in chalk or on little pennons stuck into the globe.

The second type of story. The next set of stories will bring the child nearer home. The writer has a vivid recollection of some wizard story-teller who introduced him first to the wonders of the home land, it is an abiding impression and the pleasure which the experience produced is still indissolubly connected with the recollection. The narrative was about an unknown country where the people were visited by a nameless traveller. The latter found that the inhabitants lived on meal that was baked over a fire, and fat which they got from animals they kept near their houses. The meal was obtained from plants which they grew in their fields. Sometimes the country was cold and then the people burned black stones which were dug from deep holes in the ground. Sometimes it was hot in that land and then the people changed their clothes and wore garments made from threads which were obtained from distant lands far over the sea; the discarded warmer garments were made from the hair of animals which the people looked after themselves. Most of these people were shod in the skins of their animals which were so prepared that they would last during hard wear. Gradually through the mist of suggestion and innuendo due to a careful choice of terms in which to describe everyday things the child began to wonder whether this unknown land was different from his own; wonder gave place to conviction, and by the time the story was ended and the question was asked "What country did this traveller visit?" the reply was trembling on the tongue of an eager child scarce able to restrain the exclamation "Why, England, of course!"

The stage which follows that of travellers' tales is marked by a first attempt to provide the child with a connected account of the world as a whole. The connecting thread in the previous stage was supplied by the fact that in each story a traveller or explorer had been to the land and seen the things which were described. The connecting thread now becomes the life of the inhabitants of these lands as conditioned by the vegetation which occurs in their country.

A commencement is made with the cold region to which the term tundra is attached, and this is followed by the greatest contrast, the hottest region, that of the tropical forests. In the case of each region the vegetation is described and the life of the people is depicted in connection with the work which they must perform to support life in such a vegetative environment.

The contrast between the continuous effort required from the Eskimo and the comparative lack of effort required to obtain food in the clearings within the tropical forest is significant, and leads to the consideration of the next region, that of the hot deserts where any form of life persists with great difficulty. The contrast between the absence of warmth on the tundra and the absence of water in the hot deserts is sufficiently definite for children of this age.

The region of the temperate forests of the Northern Hemisphere with its winter mantle of snow is next introduced in relation to the summer warmth and its consequences; and the world industry of lumbering receives in this connection introductory treatment.

An account of the grass-lands of the world follows naturally; first, the grass-lands with winter snows and later the snowless grass-lands which tend to be arid owing to a scanty supply of rainfall. In connection with these grass-lands some attention is paid to cultivated grasses and to the world industry of farming, and thus the place of the home country in relation to the rest of the world is described.

Throughout this stage of progress the teacher's duty is to describe these regions as vividly as he can and to use the globe continuously. On the globe he will substitute for the former names the correct names of the continents and the chief countries. During his description of the vegetation controls he will naturally refer to rainfall as a chief factor in the growth of plants, and this fact will permit him to treat of two other regions with specially marked characteristics: these are the regions of winter rainfall and of monsoon rainfall.

The account of these two regions will complete a second survey of the world, and the pupils will be quite prepared for a descriptive treatment of the continents with which the preliminary stage of geographical teaching may be concluded.

Introductory map-work. The course outlined in the preceding paragraphs only fulfils one portion of the teacher's work as specified in the first chapter: the teacher should use his descriptive lessons as a means of introducing the pupils to the geographical shorthand, and he should begin with maps.

First notions of maps may arise naturally in two ways. One method of introducing small scale maps is to emphasise the notion of the globe as a model of the world and to show that maps can be made as a kind of pictorial representation of the globe. The second introductory notion refers to maps of small areas, and for this purpose it is possible to introduce balloon photographs, and the pictorial representations of stretches of country which are becoming so frequent on the advertisement hoardings of our towns. The effort at a realisation of such pictorial representations of areas of land may be facilitated by a description of an imaginary aeroplane journey between two well-known towns: from one point of view such a description is to be preferred to that of a journey by railway train.

The next development in this connection lies in the provision of some ideas regarding latitude and longitude. The children's ideas regarding the highly abstract notion of fixing position will probably remain somewhat hazy and inconclusive, but it is necessary to let them attempt to realise the importance of this problem. For this purpose it may be well to refer to those human beings for whom such knowledge is a matter frequently of life and death. The navigator depends for his existence upon such knowledge and it is wise to describe to the children the ways in which latitude and longitude are fixed by observations of the Pole Star and of the ship's chronometer at the moment of local noon. From this point it will be possible to introduce, by the historical method, the ways in which the knowledge acquired by sailors and fishermen has been fixed upon charts so that coast-lines are mapped and latitude and longitude are shown thereon.

An alternative method of introducing the study of world position depends upon the historical account of the ways in which the ancients discovered latitude and longitude, before coast-line maps had been made with any great degree of accuracy.

Meanwhile, the necessity for latitude lines will have arisen in connection with the work with the globe. Lines may be drawn on the globe to indicate those countries which are half-way between the poles and lie near the equator. Similar lines may be drawn for countries half-way between the equator and the two poles, third-way lines may be drawn, and so on.

The crucial step then arises of the change from the fractional names of these lines upon the globe to the parallels of latitude with their customary map numbers.

Longitude is introduced in relation to time, and experience shows that the globe can be used in conjunction with the lantern to demonstrate this connection. The method to be used will be described in a later chapter.

All this work on maps should progress along with the descriptive work which has been detailed in previous paragraphs, and the third summary of the world, by continents, should be begun as soon as these notions of maps have been mastered.

Three other kinds of maps may be gradually introduced in connection with the continents: these are relief maps, rainfall maps and maps showing density of population. All such maps should be confined to at most three divisions of the land:

mountain, upland, and lowland; heavy rainfall, moderate rainfall, and scanty rainfall; dense population, moderate population, and sparse population.

The pupils' co-operation. The summary of the descriptive work by the study of the continents in turn should be accompanied by an attempt to bring the pupils' own activities into play. There are several ways in which this may be done. One of the most valuable methods is to get the members of the class to co-operate in making a class collection of pictures, post-cards, and typical objects which have some connection with the land under description. Another method is to begin the use of tracing paper. Let each child make a traced map of the country studied, and let him enter on his map as a homework exercise a summary of the main facts learnt about the country. At the most the number of names on such maps should not exceed ten. Instead of the traced maps, the children may be encouraged to make sketch maps as soon as they show sufficient ability with the pencil: these drawings may be made from the globe or from a flat map. Another form of indoor work of this kind depends upon the co-operation of the art master. Typical views of geographical bits of country may be provided for the children to colour. A book of such views prepared for colouring may be obtained for each child, or the art master may be keen enough to draw sketches from photographs and set the children to make copies of these and to colour them.

This work forms a convenient exercise for homework after the main rudiments of the process have been grasped from lessons in the art room. If the art master will make the large coloured drawings of the pictures which the children are to copy from geographical photographs supplied by the geography master, it will be possible to give a lantern lesson and to show the children other photographs of a similar type and to introduce at this stage the notion that man's life is limited by his environment. Suggestions for such lessons occur in a later chapter[1].

Out-door work. Finally, there occur opportunities for out-door work. So soon as the work in Nature Study has progressed far enough, the geography lesson may well be occupied with a discussion of the trees in the neighbourhood of the school, in relation to previous work on the world's forests. There will be some trees which are truly typical of English woodland, but there will also be some trees of which the occurrence in the neighbourhood of the school is purely accidental, and attention may be paid to these trees to investigate the reasons why such isolated specimens of trees can grow, and to discover the effects upon such trees of their growth in conditions which are not truly favourable to them. A visit may be arranged to local botanical gardens to emphasise these points.

Co-operation with the teacher of mathematics may also begin at this stage. Measurements of the room, of the playground, and the preparation of plans of both may form part of either the geography course or the mathematics course, at the discretion of the two colleagues ; it would, perhaps, be better that such plans form part of the mathematics course and that the geography lesson should carry on such work by making plans of the surroundings of the school. For this latter purpose the child should be introduced to two methods of measurement: (i) striding to measure distance, (ii) sun position to get compass direction.

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[1] For a fuller account, see *The Geographical Teacher*, Summer Term, 1914, p. 307.

For purposes of measuring distance each child should know how many strides he takes to go 100 yards. If three children measure the same distance by striding, it will be possible to get a fairly close approximation to a short distance, say, the length of the street in which the school stands.

Lessons on sun altitude to mark a north and south line may be taken in the playground; and, when north and south lines can be obtained, then the compass directions can be determined with sufficient accuracy to make a rough plan of the school district. Such open-air work on sun-noon will fit in with the lantern lessons on longitude to be described subsequently.

Work of this kind, to which the term *practical work* is frequently assigned, can be introduced gradually as a preparation for the notion that geography is a study in which the child can do a very large proportion of the work for himself. Such a notion will counteract any tendency to bookishness. Some teachers even go farther in this direction than has been suggested. In connection with the pictorial method of representing first notions of hills, valleys, peninsulas, etc., the children are sometimes encouraged to make use of a sand heap in the school grounds to represent in solid form their notions of hills, gaps in a hill range, valleys, etc. Such work forms an admirable preparation for the study of contour lines, since poles may be stuck into the sand, and lines representing equal heights of sand may be drawn upon a sketch map of the sand construction. If the school is situated in a district in which Nature has been kind enough to provide examples of land forms, it will be possible to take expeditions to view the actual scenery and to reproduce the main features in miniature in the sand and then to measure the relative heights and make contours, and to compare these contours with those on the Ordnance Survey map.

CHAPTER III

TRANSITION GEOGRAPHY

The home land. The term transition geography refers to that stage in teaching wherein the pupil is mainly concerned with the investigation of geographical principles, rather than with the acquisition of geographical facts. The main purport of this stage is to train the child in the meaning and use of geographical shorthand.

During the later portion of the preceding stage, the child was gradually introduced to the notion that he was to do much of his work for himself, and it is now time that he began to make discoveries of facts and to suggest his own generalisations.

For this purpose it will be well to confine the attention of the children at first to the home land, and then to extend the knowledge of principles so attained, by applying them to a wider region, the area which surrounds the North Atlantic Basin. At the same time, the world setting both of the home land and the Ocean shorelands must be preserved; thus the subject-matter of this stage will be Britain, Western Europe and Eastern North America, with reference to the world as a unit.

The process of investigation must follow a consistent plan. Relief, climate, vegetation, mineral deposits, occupations and distribution of the population, production and trade, communications and trade routes, are the main headings under which the geographical story should be studied. The interrelation between these factors must be emphasised. The first three heads—relief, climate, and vegetation—allow of a diversity of treatment.

Relief should be studied first in relation to the home district, and should expand outwards. From the home area to the home county and the home country; from the home country outwards over the world, is the sequence to be followed. Consequently, in the transition stage the work will be confined to the investigation of the main features of relief and their representation upon maps. The child should at the end of this period be thoroughly able to read relief maps.

Climate and vegetation: alternatives. Climate and natural vegetation are to some degree alternative. It is largely a matter of indifference whether the teacher begins with climate and then passes to the vegetation regions so as to emphasise their interrelationship; or whether he begins with vegetation and introduces climate as one of the factors which control the vegetation. There is no necessity to determine a stereotyped plan for all teachers or for all schools.

The decision of the teacher will depend to some degree upon the rest of the school curriculum ; if there is an emphasis upon nature study and botany, then vegetation may precede climate ; if the bent of the curriculum is towards natural science, especially physics, then climate may well be taken first. In either case it must be remembered that geography builds upon the results of the other sciences, and that it is not the business of the teacher of geography to teach either botany or physics.

Stress is laid upon this matter, because the essence of geography lies in the fact that its generalisations are not of the nature of the scientific generalisations usual in schools, the generalisation of cause and consequence : geographical generalisations are of the nature of interaction, co-existence, continued co-operative action.

An example will emphasise this point. The sequence of instruction may be : winds, rainfall, temperature, coincident vegetation, or it may be vegetation controlled by temperature and rainfall, which are controlled by the winds, and finally are due to the sun's activity.

The principle of triangulation. At this stage it will suffice to teach the principles of triangulation so far as they are developed by the use of the plane-table and the angle meter. The work should occupy definite stages. The first stage occurs in regard to the methods of work and should embody the use of home-made apparatus. **Distances.** A level board and a ruler with two large pins, one at each end near one edge, suffice as apparatus. In the school ground, a tennis court or a football pitch forms a convenient rectangle at which to commence operations. A base line is measured with a chain or tapes. Lines are drawn from each end of the base line along the edge of the ruler when it is sighted at the corners of the rectangle. The intersection of corresponding lines marks the plan of the rectangle on the paper which is fastened upon the board. **Heights.** A jointed rod suffices to measure angles. A base line is again measured. The angular height of a convenient point on the school building is measured by the jointed rod and a protractor from each end of the base line. A plan is drawn to scale, and the height of the object is determined by measurement from the plan. The second step consists in the use of the plane-table which may be taken to a convenient field or park, and a plan made upon the spot. The third step consists in the use of the angle meter to measure heights instead of the jointed rod.

In connection with this work, the help of the mathematics teacher should be invoked so that the justification of the use of the methods involved may be obtained. The conditions under which triangles are similar, or the proposition that triangles are congruent when one side and two angles are correspondingly equal, summarise the mathematical knowledge here required.

At a later stage in the mathematics course, the principles underlying the use of tables of cosines or tangents may be illustrated with reference to the calculations, instead of the measurements of a drawing to scale, which determine the heights.

Contours and relief. At first it is necessary to illustrate, by experiment, the method by means of which a line upon a plan may indicate points which are at the same level. An experiment of this kind has been mentioned in the last chapter in connection with sand in the playground.

Some teachers make use of smaller quantities of sand or of plasticine or of modelling clay in a similar fashion for the same purpose. A model of a hill is made: pins are inserted in the sand so that their heads just emerge from the surface; threads are arranged connecting the heads of the pins. A sketch map is made of the threads, which represent contour lines on a map of a hill.

Other teachers take a class out on to a convenient hill-side, and arrange the pupils in lines along the slope of the hill so that the feet of the pupils are all at the same height. An imaginary line connecting these feet would be a contour line on the hill, and a sketch of a series of such lines would make a contour map.

Having determined what a contour line is, the next step is to investigate typical contours; a commencement may be made with ridges and valleys. Contours show ridges and valleys by typical V-terminations. By one of the methods outlined above, the distinction between the V's for a ridge and the V's for a valley can be determined. If there is a system of model making in vogue in the upper portions of the school, then a typical model may be used, and if the negative from which the model was cast is shown as well as the positive model, it will be clear that the ridges of the positive are the valleys of the negative and *vice versa.* The V's which mark a ridge on the negative, mark a valley on the positive.

Further work on contour maps follows in connection with typical forms such as a gap between two hills, the junction of two valleys, the distinction between steep and gentle slopes, etc. For this purpose some method of solid representation is best.

The cardboard layer system may be first used. Thicknesses of cardboard may be cut with a fret-saw to show the shape of layers of country where the level is between two contours. These thicknesses are glued in position over each other to make a stepped model of the district. Some stepped models are singularly effective, but the majority of them should have the step formation obscured by means of clay, plasticine or plaster of paris, so that eventually a solid model of the district is obtained. At this stage all the work has simply illustrated the way in which contour lines may be interpreted; during the remainder of the work in geography the continuous manufacture and use of models to serve as a basis for further geographical argument is advisable[1]. Such models can be used for the purpose of indicating the principles underlying the construction of sections and profiles. The edges of the model show excellent sections, in fact, it is a useful check of the accuracy of the modelling for certain pupils to prepare sections along the edge of the model and to test the edge of the model therewith. So the pupil is led to appreciate the utility of profiles to the railway engineer and road sections to the motorist.

The transition from the detailed contour map of a small area to the coloured orographical wall map is helped considerably by the use of a stepped cardboard model which is coloured in layers to correspond with the colouring of the contour map from which the model has been constructed.

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[1] For methods of construction, etc., see p. 144.

An intermediate stage between wall maps and models occurs in the relief maps which are to be found in text-books in illustration of particular points of interest: the interpretation of these maps is quite an easy matter to the pupil who has had a course in the construction of models. The relief map is thus rendered, during this transition stage, so familiar a piece of geographical shorthand that the pupils have little difficulty towards the end of the period in making an analysis of a detailed map, such as those published by the Ordnance Survey. In fact, as a matter of experience, it will be found that pupils who have thus investigated the relief of the land take so readily to Ordnance Survey maps that it is comparatively an easy matter to persuade them to procure and use such maps regularly during the holidays when they are away from home.

Climate. The main object of the study of climate during this period of school life is two-fold: (i) to learn to appreciate the ways in which climatic facts are recorded and investigated, and (ii) to find out the main generalisations regarding the climate of the world, and to establish the relationship between the climatic region in which the home land lies with the other main climatic regions.

Methods of recording climatic facts are in place in school practice, until the pupil can appreciate by actual experience how weather data are obtained at meteorological stations. The observation of the thermometer, the rain gauge and the barometer should be made continuously for a short period. The numbers observed should then be treated so as to show the method of averaging such material. Numerical exercises should be provided either in the geography lesson or in that on arithmetic, so that the pupils may gradually appreciate the meaning of an average temperature as distinct from the meaning of an average rainfall. Later, average pressure and cloudiness may be related to average temperature while average sunshine may be referred to average rainfall. The pupils are then led to the first great exercise in generalisation. The tabular numerical statement of average temperatures recorded for many places in Britain, is difficult to appreciate, what can then be done? A quick pupil may suggest that temperature lines may be drawn upon a map in the same fashion as contour lines; and so the class is led to the drawing of an isotherm, and later to the construction of an isothermal map. Once this has been done, the reading of such maps follows as a matter of course, and the practice so obtained is immediately utilised in connection with isohyets and rainfall maps, with reference, at a later stage, to pressure, sunshine and cloudiness maps.

Meanwhile, practice in the construction of wind roses may follow as the result at first of the pupil's own observations, and later, as the result of the work of other investigators. Development along these lines will occupy a certain amount of time, so that practice in reading climatic maps may be confined at first to those which refer specifically to the home land.

The next step refers to the diagrammatic representation of climatic sequences throughout the year. Practice in making temperature graphs will soon show the pupils that they are all of a certain type, there is a steady rise from the coldest to the warmest month. If a series of graphs be made upon the same scale, the pupils will soon learn that the average temperature of the place together with the range of the graph, i.e. the distance in degrees Fahrenheit between the lowest and the highest points, provide an indication of the situation of the place.

At first, pupils naturally believe that temperature is merely a question of latitude, and a useful exercise occurs in the investigation of the truth of the generalisation that the farther a place is from the equator the colder it is. First of all, an inspection of the annual isotherm map of the world tends to show that the generalisation is true, but when this work is followed by a study of the isotherms on maps of the world for January and July, the pupils immediately see that the generalisation is only true in a very broad sense. When this work is followed by a study of the temperature graphs for a few selected places, the limits within which the generalisation is true are seen to be narrower still, and so the pupil is led to the notion that the British Isles have the most remarkable winter temperatures of any place upon the globe, and the correlative to the British Isles is found to be the district east of the Urals in Siberia. This notion leads to the investigation of the differences between the western and eastern coastal margins of the continents and thus leads to a rough division of the world into temperature regions.

The regularity of temperature graphs may lead the pupil to expect that rainfall graphs would show a similarity in regularity of shape. The construction of specimen rainfall graphs dispels this notion, and the construction of many rainfall graphs for selected places eventually leads the pupil to formulate a general statement of the rainfall regions of the world.

So soon as this stage has been reached it will be possible to combine rainfall and temperature and divide the world into climate regions. The attempt to do this should be accompanied by some consideration of the other climatic factors, particularly winds and sunshine.

The moment the teacher reaches the question of winds, he has to decide what he is to do regarding the barometer and isobar maps.

He will probably find that even in schools where physics is taught the pupils are yet a long way from reaching the stage in their science course when they attempt to investigate the principles of the barometer. The teacher of geography may treat this impasse in two ways, but by no means should he attempt to do the work of the science master.

The first method is to treat the barometer after the fashion in which the ordinary householder treats his gas or electricity meter. He makes no effort to understand why the barometer moves, it suffices for him that the indicator shows different positions from day to day. He can call upon the weather lore of the average man to find that when the barometer rises men expect finer weather, and conversely. He can take the pressure numbers as his starting-point, and by means of a series of exercises can teach the pupils the relation between the pressure records in isobars and in graphs, and the climate of the place under investigation.

Taking the isobars for the North Atlantic as recorded on a weather chart and the wind directions as recorded upon the same chart, he can provide for his pupils an adequate heuristic exercise so that they may find the relation between wind circulation and barometric pressure for themselves. In such a fashion he can teach his pupils to read pressure maps sufficiently well for them to apply their knowledge to the study of the pressure maps for January and July for India, so that they can themselves draw on an outline map the probable wind directions over the Indian Ocean and so learn the primary fact connected with the term monsoon.

If he follows this course, he must be ready, so soon as the pupils have finished the work on the barometer in the science laboratory, to make use of their additional knowledge to review the facts that have been previously learnt in the geography lessons in the light of the new knowledge, so that the pupils at last appreciate the principles underlying the barometer and their application to geography. When this has been done, the pupils are in a position to study Daily Weather Reports, not only for Britain, but for any other country, and the teacher should make such a study the supreme test of the value of his previous work.

On the other hand, the teacher may choose to leave the barometer and pressure maps severely alone until the work in the science classes has been accomplished: but he must be prepared with an alternative course.

The method suggested depends upon sailors' observations of wind directions and the records of wind directions as averaged and published for the use of the navigator. His pupils have made wind roses and can appreciate maps showing wind direction. Consequently, they can appreciate the fact that in certain parts of the world the winds are steady all the year round, in other parts of the world they reverse the direction in which they move with the seasons, and in other parts of the world they are more or less variable. Consequently, the pupil can make a division of the world into wind regions, and this division can be correlated with the divisions previously made into temperature and rainfall regions, so as to improve the conception of the climatic regions of the world.

The relation which occurs between wind direction in reference to the sea and rainfall can then be made a subject for further investigation, until the conception of rain-bearing on-shore winds can be used to explain the causes of the winter rainfall which characterises the shore-lands of the Mediterranean.

Summarising this discussion of the treatment of climate, it may be pointed out that the climatic facts regarding the British Isles are learnt during the period in which the shorthand of climatic geography has been learnt ; that the conception of world climatic regions has been learnt during the period when the knowledge of climatic shorthand has been applied, and that the specific relationship between the climate of the British Isles and that of the rest of the world is learnt when the climatic facts regarding the surrounding region demonstrate that Western Europe is a region with a climate typically its own.

The final test of the thoroughness of this work on climate occurs when the pupils are asked to study various climatic facts stated numerically and to attempt to locate the place which has such a climate[1].

Vegetation. The treatment of vegetation during the transition stage is begun by drawing together the threads of previous work. The first thread is the conception of the vegetation types of the world which has arisen naturally in the descriptive stage, when the typical vegetation which surrounded the homes of men was described in order to provide some notion as to the work which men perform in various parts of the world. The second thread is the study of the vegetation map, which summarises the experiences of many travellers and, in a sense, epitomises the teaching of vegetation in the descriptive stage, and provides the means of entering into additional detail as the pupils become more able to grasp the meaning of a map. The third thread is due to the discovery of the main climatic regions of the world as discussed in the preceding paragraphs. These threads must be woven together to make a complete fabric. The sequence—sunshine, winds, rainfall, plant life—is perhaps the best means of securing this end. The winds of the world provide the rains which nourish the plant life which exists in the world. The pupil can superimpose traced rainfall and vegetation maps in order to fix definitely the correspondence between, for example, tropical forests and the heavy rainfall of equatorial regions, and between the wet west coasts of temperate lands and the temperate forests, as well as between the desert and the region where the rainfall is less than 10 inches per annum. Similar temperature maps will show the correspondence between the tundra and the region where frost prevails almost continuously and where only for very short periods plant life is possible; and between the prairie grass-lands and the regions where there is snow in winter, in contrast with the savannah where there is never snow.

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[1] See ques. 4, p. 180.

At this stage it will be suitable to introduce maps showing the distribution of the wild animals of the world, and to show the connection between the cold climate and the dwarf trees and the lands where white foxes are hunted and where the wild wolf wanders. Similarly, the savannah lands of Africa can be related to the herds of antelopes which find therein their sustenance. Animal maps are useful because they emphasise one important point, that although lands may have similar climate and similar plant life, yet animal life may be of quite a different type. The young geographer may argue, given a region where the rainfall is less than 10 inches annually and where a high average temperature obtains, that the climatic conditions of the new region will resemble those of the Sahara, but the young geographer should also learn that given two areas of similar climate there will be savannah grass-land, but not necessarily the same forms of animal life.

At this stage, also, it may be fitting to introduce maps showing the distribution of the native races of the world, since these races are almost entirely dependent upon climate and its consequent vegetation. Such maps will enforce the conclusion already reached with regard to animals, and will prepare the way for the treatment of cultivated plants and cultivated animals as controlled by climatic and vegetation conditions which is the subject-matter to be discussed at the next step.

The human element. The dependence upon the human element, which has been noted as the essential factor in modern geographical teaching, is not apparently emphasised in the early portions of this chapter, but there is no need to do more than call the attention of the teacher to the fact that in the conversation which he has with his pupils or in the class discussions in which the work of all the pupils is coordinated in those cases where they have been set to do different practical exercises, there occurs abundant opportunity to bring out the dependence of man upon climatic and vegetation conditions. By so doing he will prepare the way for the more elaborate discussion of man's efforts at cultivating plants and rearing animals which is to be considered in the next chapter, which deals with the second portion of what has been termed transition geography.

CHAPTER IV

TRANSITION GEOGRAPHY (*contd.*)

Man and his environment. So soon as the division of the world into the main natural vegetation regions has been accomplished, it becomes time to introduce definitely into this part of the course the study of the work of man in relation to these great sub-divisions of the world. In the preceding chapter some attention was paid to the indigenous inhabitants of the world, without paying very much attention to the Caucasian race; it is now necessary to attend to the great ramifications of the latter people over the whole world.

The indigenous races[1] on the whole, mark the degree to which man has been controlled by the static geographic factors of his environment; the story of the Caucasian race is however characterised by the control of his environment by man. This last statement does not mean that the Caucasian has not been limited by his surroundings, for no man lives apart from the climate and the hills which form his immediate environment, but it may be taken to imply that the present condition of the Caucasian peoples is one of contest and victory over the environment in which they have come to dwell.

This latter circumstance is well brought out in regard to the cultivation of the soil. The pupil has been introduced to the two kinds of grass-land and to the two main kinds of forest, and he has learnt that on the whole, outside Africa and Europe, these great regions are not extensively peopled by native races. He is now introduced to the work of the white man who has settled in these regions and destroys the forest and destroys also the natural fertility of the grass-lands that he may earn a livelihood.

The first great point to be emphasised in this connection lies in the fact that the major portion of such white man's work is commercial; the sheep-rearer of New Zealand, the Argentine *estanciero*, the rancher of the great prairies, and the Russian settler on the Siberian steppe are at work to provide food-stuffs for the millions of workers in factories and machine shops who crowd the oldest portions of Western Europe and Eastern North America. Such people are therefore at work from an entirely different point of view and with an entirely different outlook from the indigenous peoples who live in such lands and lead a self-centred and self-contained life.

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[1] See p. 219.

In describing the native races it has been sufficient to refer to the fact that they cultivate the soil for certain food-stuffs which they themselves, on the whole, consume: the facts which have been so determined may be summarised upon distribution maps which show the range of the crop. Such maps make no reference to the quantities of the crops which are grown, as it may safely be assumed that on the whole they suffice for the immediate needs of the people who produce them. Distribution maps tend to indicate merely the range of the crops, the limits within which they may be grown; and, for school purposes, they supply the pupil with a measure of possibilities and so lead him to a preliminary appreciation of the fact that geographical environment at first determines the range of a given crop.

Quantitative measurement. But the moment the pupil is led to consider the work of the white man, the questions of quantity, and of relative importance to the world as a whole, rise into predominant importance; it is no longer a matter of the growing of the crop, but of the successful growth of the crop in larger quantities than are needed for home consumption, and these questions immediately force the attention of the pupil upon the fact that in producing such crops the white man in one country competes with the white man in another country, and therefore is forced to make some efforts to control his environment.

The attitude of the pupil to this matter of quantitative geography and to the relative importance of the white man's work in various lands merits therefore careful attention, and it may be noted in passing that geography supplies in this connection an excellent contrast to the school training in physical science, which deals almost exclusively with the measurement of small quantities which are capable of very accurate determination. The quantitative facts of geography, on the other hand, are of large dimensions and are extremely varied, so that their accurate measurement is a matter of some difficulty. Hence the importance to the pupil of the ideas of averages and percentages, both of which arithmetical terms signify to the geographer a method of arriving at constant values which measure the work of man in relation to the accidental fluctuations which necessarily occur in lands with varied seasons and possible political strife.

During the transition stage, the pupil is mainly occupied in learning the shorthand of this aspect of geography in order that in his later work both in school and out in the wide world he may be equipped with ideas and with methods which will enable him to tackle successfully problems of which the solution depends upon quantitative geographical measurement[1].

Consequently, the pupil is introduced to two methods; first, the representation of the world production of a certain crop, and secondly, the numerical treatment of the divisions of a small country, such as the British Isles, so that he may obtain some notions of the way in which the portions of a country contribute to the grand total which has been noted in compiling the world table.

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[1] For further remarks on quantitative measurement, see *The Geographical Journal*, Jan. 1912 pp. 22–26, Aug. 1912 pp. 175–8 and *The Scottish Geographical Magazine*, Oct 1912, pp. 524–34

Finally, the fact that these producers are not self-centred is emphasised by the consideration of the degrees to which different lands contribute to the consumption of the British Isles treated as a specimen of the great importing countries of the world.

For the purpose of this quantitative treatment it is essential that the pupil should grasp facts such as "France grows one-tenth of the world's wheat," "The United States grow about three-quarters of the world's maize," "More than nine-tenths of the world's rye is grown in Europe," "Australia contains one-seventh of the world's sheep and contributes about one-fifth of the world's wool."

Diagrams. It will add to the pupil's grasp of such facts if he uses a diagram which demonstrates quite precisely not only such a main fact but also the relative proportion of at least three of the great competitive producers of the same crop.

There are three ways in which such facts and diagrams may be presented to the pupil. First, he may be provided with numbers and diagrams, and asked to memorise the latter: secondly, he may be presented with a percentage table showing the chief countries which produce the commodity in question, to construct a diagram to show respective proportions and to determine from his diagram simple fractional values of the kind indicated; thirdly, he may be provided with a table of absolute quantities and may be required to construct therefrom a table of percentages and then proceed as in the second case.

Some teachers will prefer the second method, but there are two ways in which the pupil may be asked to deal effectively with what may be called the raw material: with the consent of the teacher of mathematics, the calculation of the percentage table may form an exercise in the arithmetic lesson, or the teacher of geography may show the pupil methods of calculating percentages which are rapid and at the same time sufficiently accurate for his purpose. These rapid methods are either graphical or depend upon what is usually called the trickery of mental arithmetic. The graphical method consists in taking a sheet of

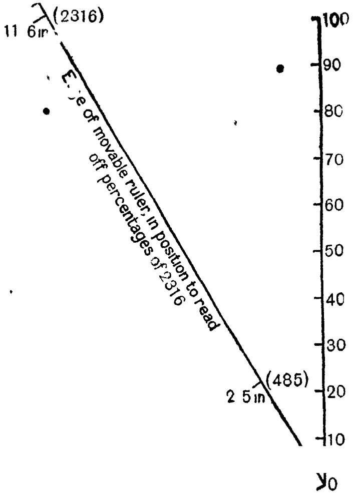
(2316)
11 6in
Edge of movable ruler, in position to read off percentages of 2316
(485)
2 5in
100
90
80
70
60
50
40
30
20
10
0

Fig. 1. A Graphical Method of Estimating Percentages.

squared paper and setting up along the right-hand margin a scale from 0 to 100 so that each tenth of an inch represents a unit. Suppose it is required to find what percentage 485 is of 2316. A scale is determined and mentally borne in mind along the edge of a ruler which measures 1 foot. This scale depends upon the number 2316, and is arranged so that the number 2316 is represented along the edge of the ruler by a length which is more than 10 and less than 12 inches in length. On a scale of 1 in. representing 200, the number 2316 is represented by 11·6 inches. On the same scale the number 485 is represented by 2·5 inches. The ruler is now placed upon the paper, the zero of the ruler against the zero of the scale, 0 to 100. The 11·6 mark on the ruler is arranged to be opposite the 100 mark on the scale, so that the ruler lies obliquely on the squared paper; the pupil now finds that the 2·5 mark on the ruler is opposite the 21 mark on the scale and he determines the fact that 485 is 21 % of 2316. (Fig. 1.)

In the case of mental arithmetic, much depends upon the number which forms the grand total of the table under discussion: e.g. 1124, 801, 1656 are numbers which may occur. To find percentages of 1124, subtract one-ninth from each of the numbers in the table and divide them all by 10, in the case of 801 add one-fourth to each of the numbers and divide by 10, in the case of 1656 multiply all the numbers by 6 and divide by 100. In the case of all these rapid methods, the pupil is taught to check his work by the fact that the grand total of his percentage table should be 100. Attention to these rapid methods for a brief space will make most of the pupils independent of the arithmetic lesson, and will provide the kind of outlook upon numbers and large quantities which is requisite for the pupils in after life. Such time is therefore well spent.

The result of this work is that the pupils know not only where the great cereal crops are grown, but also the quantities which are respectively grown by the chief producers, and also the quantities to which these producers contribute to the supplies into the United Kingdom.

Such numerical work appears divorced from the consideration of the life of man in the world, which is the main thesis of school geography, but when it has been completed the teacher has his golden opportunity.

Class discussions. Class discussions, or more formal lessons, are now in place. The pupils are acquainted with a set of facts, and the matter now is to set them into position in regard to the geographical outlook. The teacher gets the pupils to realise that these products—wheat, oats, barley, maize, rye, sheep, cattle, wool, meat—are the necessities of large numbers of people who are crowded into the densely peopled factory districts of the shore-lands of the North Atlantic basin, that these products are due to the labour of men who are scattered over the sparsely inhabited white man's lands in America and Australasia, that over thousands of miles of sea the link of demand and supply indissolubly connects the workers in these two kinds of countries, that the prosperity and the livelihood of the one kind of worker is bound up with the prosperity and livelihood of the other, and that the competition, which the producers face, causes them to conquer nature. This conquest of nature may be emphasised in connection with irrigation, with dry-farming, with the growing number of experimental farms, and in certain cases with other facts which serve to emphasise the diversity which is hidden under such a general term as the world's grass-lands or the world's wheat fields. Such facts would include a discussion of the wheat-production of India in relation to season of growth, a discussion of kinds of seed and length of time between sowing and reaping, a reference to the movements of labourers, Italians to the Argentine, Scandinavians to the United States, even Irish to Great Britain. some details of the way in which the New Zealander clears his ground from the bush and sows grass-seed obtained from England, or of the utility of alfalfa to the farmer on the semi-desert lands. The numbers at first loom large in the minds of the pupils, but, with the teacher's help, the children fill in the picture so that finally their outlook is upon an ordered world, where no man is a law unto himself alone, but all men work together for a common end. For the romance of the discovery of the known world the teacher substitutes the romance of man's gradual harnessing of nature's forces, a romance which is neither mean nor sordid although it refers to almost every mouthful of food which Britons eat.

So the story of the grass-lands is told in outline.

Next in order is the story of the forests. Timber for houses, or for cabinet-making, or for pit-props, tar, turpentine, wood pulp, rubber and some of the essential oils are the produce of these great natural regions. At first, the climatic controls of forest growth are determined and the limits of forests are mapped.

Then follows the treatment of man's work in the forests. In the beginning man's work is destructive, and the account of the lumberer in Sweden, in America, in New Zealand, is a tale of destruction accompanied by reference to the facts that such destruction is orderly, is conditioned by times and seasons, so that even here man is controlled by his environment.

But man's needs are ever increasing and destruction must be accompanied by conservation, and the pupil must fill in his picture of the forests by knowing something of the afforestation, of the rubber plantations, of the Arbor Day movement, which mark the beginning of man's conquest even of his forest environment.

Man's needs are, however, not limited to the products of the grass-lands and the forests, the world is scoured for articles which may make life easier or more healthy. Fibres such as cotton or jute, food-stuffs such as rice or tea, medicines such as quinine, plant produce of varied kinds, all are required. Most of these products are found in countries where the white man is unable to endure protracted spells of manual labour, and so the pupil is led to the story of the efforts of varied indigenous races to respond to the compulsion of the white man, either direct compulsion which occurs in connection with such produce as wild rubber, or cocoa, or indirect compulsion which is manifest in connection with rice or tea. The lesson here is that the self-centred peoples are only of importance in the degree to which they respond to their world environment by partially ceasing to be self-centred.

The distribution maps which have been made in the descriptive stage have fixed the limits of production, quantitative work of the kind described in the earlier portions of this chapter fixes relative importance, and the teacher completes the picture by some account of the work of white overseers on the rubber, coffee and tea plantations, and by reference to the romantic story of the rise of the cotton-growing industry, which will bring his work into close contact with that of the history teacher. The white man's environment includes members of apathetic indigenous races, and the white man is controlling his environment when his needs force such peoples to lose their apathy and learn something of the forces which control the world of to-day. So, in this transition stage, is the world surveyed: example follows example, and the whole treatment is different in idea from that of the descriptive stage: at that time the pupil learnt how people lived where they were, now he learns in part how such people are surrounded by circumstances which tend to make them live and work otherwise from the ways which were sufficient to their ancestors. The balance of importance has been shifted from the description of their purely local and personal needs to the description of the needs of the world and their response to the demand for world supplies.

British supplies. Consequently, an important part of the work at this stage lies in the discussion of the sources of British supplies of varied commodities. The treatment begins by quantitative work and then passes to the story of the competition which arises, and the results of that competition, so that the pupil finishes by grasping the idea of British ships traversing all the seas of the world, carrying produce from the ends of the earth to supply our needs.

But side by side with the question of our imported supplies is the question of our home supplies of such commodities as lie within our scope, and so the pupils are called upon to study the work of the British farmer, the work of the majority of our people who live on the land.

Numerical work upon Britain as a wheat grower, as a rearer of sheep and cattle naturally falls into place here. The pupils are supplied with data which tell them where these industries are carried out most easily and most extensively, and they make maps and diagrams to emphasise the facts. It will be convenient to consider the treatment of wheat. The pupils are provided with data regarding the average yield of wheat in bushels per acre in the various counties of the United Kingdom.

They make a map to show the best, the moderate and the poor wheat-growing areas; they discover that wheat is best grown in the eastern parts of the kingdom, where the rainfall is least and where the lowland is most extensive and the sunshine is longest. They find that oats, by comparison, can be grown where the rainfall is heavier and the sunshine less in quantity. They discover the factors which govern the production of wheat, but their work is not concluded. They treat similarly data which show the relative total quantities of wheat grown.

From a table of counties which produce large quantities of wheat as measured in bushels of yield in comparison with total area of county they construct a map showing the districts where much wheat is grown. This map differs from the previous map which shows where wheat grows well. The Scottish wheat growers are found to produce wheat with great ability but not in great quantity, and so the pupils learn the fact that the production of crops depends upon the land devoted to the crop and, also, that from the point of view of quantity the great wheat-growing area is confined to the Eastern Counties of England. Such an analysis of two kinds of data is extremely useful as a corrective of the notion that mere quantity is of supreme importance.

Mining. Hitherto, the pupil has been trained to an orderly conception of the world which is of a dual nature; orderly from the circumstances which occur in the immediate surroundings of the region considered, and equally orderly because the rest of the world has exerted a constraining influence which has tended to progressive growth. The next step is the conception of a set of conditions where the local circumstances are accidental, rather than orderly, and where the conception of order is dependent upon extraneous circumstances. Such conceptions arise with reference to the exploitation of mineral deposits. The occurrence of minerals in nature is purely a geological matter, such deposits have no geographical importance until they are exploited and the essential feature of the geographical significance of minerals lies in the sense of order which arises from the consideration of the reasons why some deposits are exploited while other deposits are left untouched. The whole conception rests upon the idea as to whether it will pay men to work at extracting the ore and turning the ore into the metal for which the world makes demands[1].

In the transition stage the pupils may be told of the gold which occurs in Britain but which is not worked, and of the tin and copper mining which still prevails to a small degree, and from this consideration they may be led to the study of the iron and coal deposits of Britain.

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[1] See p 219.

There is a semblance of orderly arrangement in the British coal fields in relation to the Central Upland of Britain and the teacher will make the most of this fact, but the iron fields apparently lack even this semblance of order, for some iron is mined from the shafts of the coal mines, and other iron ore is obtained in Cleveland, Furness and in Lincolnshire apart from the coal fields.

The treatment of minerals involves the mapping of those deposits which are worked, the estimation to some degree of the quantity of produce mined in each case, and finally the uses to which the mineral is put.

Fishing. From the school point of view, the world's fisheries present much the same accidental nature as the world's mineral deposits; hence the pupil learns where the fish are caught and the places to which the harvest of the sea is sent for consumption.

The British Isles. The final portion of the transition stage is occupied with a first study of the British Isles and the neighbouring lands overseas.

The relief of our own islands has been considered in detail, the facts regarding relief have been set in their appropriate climatic and vegetation environment, the accidental occurrences of coal and iron have been noted, and the farming which is carried on has been determined; consequently, it is possible to make a first study of the distribution of the population, in especial relation to their work as factory and machine room workers. It is time to consider town life as distinct from life in the sparsely populated farming, mining and fishing areas. The element which introduces order into the treatment of town life is largely the question of the uses to which the coal deposits have been put, and hence the British Isles can be conveniently treated in reference to the industries which have arisen upon the coal fields.

The modern localisation of cotton, woollen, machinery and hardware manufactures on their respective coal fields furnishes a means of dividing the British Isles into convenient areas for detailed study of town life.

North Atlantic shore-lands. Finally, Eastern North America and Western Europe provide areas which serve as a summary of the main facts and treatment which have been outlined and also as a means of emphasising the orderly treatment of a new country whenever such treatment arises in the next stage of geographical teaching.

Relief, climate, natural and cultivated vegetation, minerals, fisheries, distribution of the population and the occupations of the town dwellers, form the order in which the pupil is expected to apply to a new land the methods and facts which he has previously learned. The facts regarding the new land are placed before the pupil, expressed in their appropriate shorthand, and he is expected to interpret the shorthand in the ways to which he has grown accustomed. Whether the pupils work individually or as a class the method should be the same.

It should aim at testing the degree to which the pupils have acquired facility and outlook in matters geographical.

At this stage the pupils cannot be expected to detail the geographical account of a country in regard to the unique features which that country alone contains, but they should be able to give a reasoned account of the main features in which the country is similar to other countries; in other words, they should be able to place the country in position in reference to an orderly conception of the world as a whole.

An excellent test of the value of the whole course of work in the transition stage is to provide the pupils with an atlas and to expect them to write an account of the geography of a small country, say New Zealand, or Italy. Such work provides a natural transition to the final stage of geographical teaching.

CHAPTER V

SYSTEMATIC AND ARGUMENTATIVE GEOGRAPHY

A survey of the world. After completing the transition stage the pupils will have had a little experience in writing an account of the general geography of a given country, and the first step of this final stage is to complete a survey of the world and utilise this experience.

For this work it is necessary to provide the pupils with the data from which they can draw their own conclusions regarding the Position, Size, Relief, Climate, Natural and Cultivated Vegetation, Density of Population, Mineral and Fishing Industries, Occupations of the People, and Communications of any country. Such data will take the form of quantitative material from the Blue Books and adequate maps such as those in the Atlases of the World's Commerce and Meteorology.

It will probably be found that the teacher must do most of the work in abstracting the information from the Blue Books, and must remain content with showing the pupils in a few specimen cases how such work is performed; on the other hand the pupils can be expected to interpret the maps without his direct and immediate assistance.

As regards the quantitative matter, the teacher will find that the speed at which the pupils comprehend quantitative results will depend very largely upon the thoroughness with which they have been trained during the transition stage: as a matter of experience it will be found that pupils who have worked on the lines suggested in previous chapters can appreciate numerical data without the help of diagrams, and can obtain results from the consideration of a tabular numerical statement without any intermediate help.

Sectional work. If, however, the pupils are found to work slowly, it may be wise for the teacher to break the class up into sections and divide the work between the sections roughly as shown below.

Section	A.	Position, size, relief.
,,	B	Climate
,,	C.	Vegetation
,,	D	Minerals and the manufacturing occupations.
,,	E	Communications and trade.
,,	F.	Distribution of population in relation to the occupations of the people.

Each section should consist of two or more pupils and should be required to complete its survey within a given time. If necessary, the work of each section may be further sub divided to save time.

When the time limit has been reached, the class will discuss the work done systematically. The teacher and the pupils in section A will discuss the results achieved, the pupils in other sections will make notes during this discussion and so on, with the remaining sections. The later stages of the treatment of each area will be devoted to the unique features which give individuality to the country under consideration, so as to emphasise the main notions which are to be called up in the minds of the pupils by the mere mention of the name of the country.

When the next country is studied, section A should do the work for section F as shown above, and each other section that of the section above it in the table: by such a process each pupil will have studied the general aspects of a country in relation to six different countries and will be ready to appreciate work which may be performed at even a faster rate than is here suggested. These rapid surveys can be obtained by class discussion after the pupils have had but one lesson in which to discover each for himself a small portion of the facts regarding the country under investigation.

Comparative lessons. Either at intervals during this world survey or by a series of lessons when the survey has been completed, it will be wise to revise the work by means of a series of comparative lessons. For example, the similarities and differences between Australia and Africa and America south of the equator might form the subject of such a comparative exercise. Others are merely suggested below :

The winter rain regions. Mediterranean countries in comparison with California, Chile, Cape of Good Hope, Southern Australia.

A comparison of the two parts of Africa, the one north and the other south of the equator, to emphasise the differences due to the Asiatic land and the Indian Ocean on the east of these divisions respectively.

A contrast between India and other monsoon rain countries.

A contrast between the shore-lands of the North Atlantic basin and the shore-lands of the Pacific and Indian Ocean basins to emphasise the situation of the British Isles in comparison with the situation of New Zealand and Japan.

The contrast and similarity between the regions traversed eastwards from the North Atlantic basin and those traversed similarly westwards. The Old and the New Worlds.

The component portions of the British Empire : the contrast between Dominions and Dependencies.

Other world Empires in contrast with that of Britain.

Such a treatment of the world will be systematic, and will serve to pick up the threads which have been used throughout the transition stage and left as loose ends. During the latter stage, the pupils paid attention to various matters from the point of view of method rather than that of results, and, consequently, it will be necessary to redirect their attention to the results rather than the method so that the predominant importance which was attached to method may cease.

Geographical argument. The remaining portions of school geography are concerned with an introduction to the methods and principles of geographical argument. It will be well that the pupils should investigate during their school career some problems dealing with smaller areas than a whole country. Such problems should be introductory to later work and, therefore, should cover the main departments of geographical inquiry.

Land forms. The first study should deal with some typical land form and should be based upon out-of-door experience. The particular land form chosen will largely depend upon the situation of the school, but in most cases it will be possible to attempt to study the history of a river, so as to bring out the importance of changes which have occurred geologically and their effect upon present day conditions. The Weald, for example, will furnish sufficient material for schools which lie near to that area. In the transition stage, a model of a portion of the South Downs with the seaward dip slope and the land escarpment, and with a river gap such as those of the Adur or the Arun, and with the notches followed by land routes such as those followed by the roads to London from Brighton or Worthing might be constructed. This model should be made with the same vertical exaggeration as that of a model of North Wales to include Snowdon. In the transition stage, work on such models should be of a general nature leading up to a comparison of the facts which can be easily realised as a result of the actual inspection of the two models. Emphasis will be laid upon the contrasts and upon the relation of both solid diagrams to the flat map diagrams from which they were constructed. If possible the teacher may well use photographs which he has taken to illustrate each point to which attention is drawn: in the case of each picture he will then be able to point out two elements without which no landscape view used in a lesson in geography is complete, (i) the actual position of the camera; (ii) the direction in which the camera was pointed.

Later work at this stage may be prefaced by an actual school expedition to a place in the Weald, so that the pupils may use their eyes under the guidance of the teacher in relation to the actual countryside and its map representation. For this purpose, Leith Hill forms a very suitable objective for the expedition. Here, there are the two scarps, those of the sandstone and the chalk, with the two dip-slopes; there are three streams which rise close to the hill and which flow seawards diversely. The one, Pipp Brook, flows down the dip-slope of the sandstone to the base of the chalk scarp, where the course changes from consequent to subsequent, and finally joins the Mole to flow consequently through the Dorking Gap. The second, the Tillingbourne, flows similarly down the sandstone slope, along the face of the scarp subsequently, to join the Wey and pass through the Guildford Gap. The third, the Oke, flows obsequently, to join the Arun and reach the English Channel. The wind-gaps between consequent and obsequent streams are distinctly visible. On a fine day the scarp of the South Downs is visible in the distance and the gap of the Adur and the notches followed by the main roads to London can be perceived on the otherwise even sky-line of the hills.

Climate. (i) **Pennine rainfall.** A second argumentative study should be climatic. The importance of rainfall to Lancashire will serve as a justification for the investigation of the rainfall of the Southern Pennines.

The first step lies in the first-hand study of the recorded facts. By means of a system of cards, on which the actual rainfall for the months and for the years of a large number of places are recorded, it will be possible for a class to calculate average rainfalls for the months and for the year. From these values isohyets may be plotted and then compared with the standard isohyets of the Atlas of Meteorology or of the Survey Atlas of England and Wales. Such work will involve some discussion of averages and interpolations, and will provide a new insight into the climatic maps usually used in schools.

But the pupils should be encouraged to make some correction in regard to the monthly isohyets for the fact that the months differ in length. Consequently, they may be introduced to the term pluviometric coefficients and the data can be used to provide a second set of maps showing lines connecting places which received an equal percentage of their rainfall during the stated month. These lines bring out a totally different set of facts from those which emerge from the work on isohyets. But work on rainfall depends upon work on winds, and the next step lies in the consideration of the winds which blow over the Pennines and the amount of rain they bring. The pupils therefore use the Daily Weather Reports to discover the directions from which winds blew at certain places, and the amount of rain which fell per rainy day while such winds were blowing. From these data they construct wind roses of the type shown in Fig. 2, where the length of the bands indicates the proportion in which winds blew from eight compass points, and the width of the bands indicates the relative quantity of rain which fell per rainy day with such a wind, so that the area of each band indicates the total quantity of rain which was brought by such winds. Finally, twelve maps are prepared to indicate (i) the lines of equal percentage rainfall, (ii) the wind roses at the selected places, and from these maps conclusions are argued regarding the rainfall of the district in relation to the winds which bring the rain.

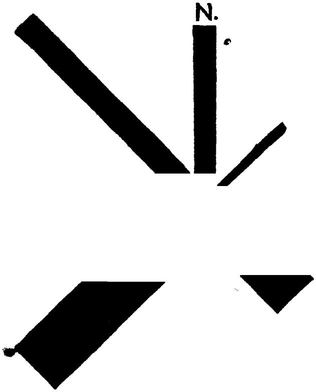

Fig. 2. A Wind and Rain Rose.

Such an investigation is necessary to determine the facts regarding the dampness of the atmosphere on each side of the Pennines in relation to the cotton spinning industry. When such work has been completed, reference can be made to the Factory Acts and the work of the factory inspectors in regard to the humidity which is permitted inside the factories of the district[1].

(ii) **Monsoon rainfall.** A second climatic investigation may be carried out to discover the complete explanation of the monsoon rains of India. The isohyets of an Indian rainfall map should be supplemented by calculations of the pluviometric co-efficients for a large number of places and the plotting of lines of equal percentage rainfall. From these values it will be easily possible to map two areas in India, those which receive 60 % or more of their rain in the months of June, July, and August and those which receive less than this amount. These maps will show the precise arrangement of the average Indian rainfall in relation to the summer monsoons of such places as Calcutta and Bombay, and the later monsoon of Madras, as well as the special nature of the rainfall in the Panjab and Sind.

Such work is followed by the consideration of the Pilot Charts of the Indian Ocean for the several months of the year. These charts show the wind directions, the temperatures of the sea water and so on. The data there contained are correlated with the work on rainfall. Finally, the air isotherms are investigated and their relation to the sea isotherms made clear. At this stage it will be possible to explain the monsoon in terms of winds, temperature and rainfall. The crucial test of the clearness of the knowledge of the pupils lies in their explanation of the desert of

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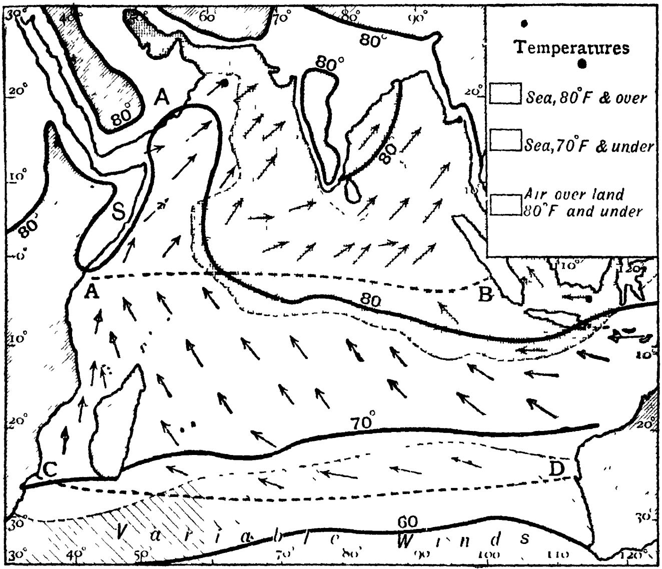
[1] For further details see the *Quarterly Journal of the Royal Meteorological Society*, October, 1914.

Thar. The explanation can, however, be pushed further back by the introduction of the isobaric maps for the months in reference to the change in wind direction. Previously, the basic fact was taken to be the accumulated observations as to wind directions which have been made by master mariners and are



Emery Walker sc.

Fig. 3. July conditions over the Indian Ocean. Air and Sea Temperatures: Wind Directions (*v* p. 61).

recorded on the Pilot Charts: now the basic fact is the accumulated records of pressure observations by meteorologists. The explanation of the variation from high pressure in winter to low pressure in summer can be next made in reference to the theories of physics, so that the geographical explanation of the monsoons is then carried beyond the confines of geography into the realms of related science.

(iii) **The winter warmth of Britain.** A similar climatic investigation may be made in order to explain the peculiar nature of the winter climate of the shorelands round the north-east corner of the North Atlantic Basin. In this case, the basic fact has reference to winter temperatures. From the consideration of isotherms for January, the evidence on the Pilot Charts of the North Atlantic regarding sea temperatures and the presence of floating ice on the ocean, it will be possible to obtain a first explanation of the facts regarding the winter temperatures of the British Isles, in contrast say with those of Labrador. The next step is the explanation of the warmth by reference to the winds and surface drifts of the North Atlantic Ocean. A further step backward is taken when the explanation includes a reference to the Gulf Stream and the facts regarding oceanic circulation, with special attention to allied currents in the Pacific Ocean. Finally, the explanation is carried still further back by means of a discussion of the abnormal temperatures which prevail in winter round a belt of the world which lies between the latitude of shores of the Arctic Ocean and that of New York. For this purpose the pupil is introduced to the notion conveyed by the isanomalous lines which are marked on certain maps. When the occurrence of these lines is related to the prevalence of continental high pressure areas in winter over the large land masses of the Northern Hemisphere, the pupil carries his explanation as far back geographically as can be expected.

Throughout these examples, the pupil is introduced to new forms of geographical shorthand, each of which has been called into existence by the necessity of formulating a simple means of recording the facts under investigation. The special wind roses, pluviometric co-efficients, and isanomalous lines are forms of shorthand designed to meet the needs of such arguments as those to which the pupil is here introduced.

At the same time, the pupil is introduced to the notion that explanation can be successively carried further and further back the deeper the problem is probed; and this continuous process tends to transcend the limits of geography and to pass into the realms of scientific knowledge of the broadest kind. The relationship between this aspect of geography and physical science therefore becomes clearer and more precisely marked.

A practical difficulty. First-hand investigations of climatic data, such as have been suggested above, occupy much time, even when divided amongst many pupils. No teacher should attempt such work unless he is certain of the active and enthusiastic co-operation of the class. As a matter of experience it has been found that some work of this nature is performed most effectively and efficiently as a break in the steady routine of acquiring knowledge. An opportunity of this nature is provided by the period of several weeks duration which fills the interval between the annual external examination and the end of the summer term. The pupils are not very keen on the old work, it is not advisable to commence the work of the next grade and some work of a different nature is useful.

This interval, which coincides with that between the transition and the argumentative stages, may well be occupied with a piece of original investigation; if the results of such work be published, the pupils take pride in the school record for useful work and in later years their successors are more ready to accept results which have been worked out in their own school.

There is a very large field in climatic matters alone for work of this description; for example, the rainfall of Lanarkshire or of North East France might be investigated in relation to the similarity which it bears in amount, relative intensity and monthly distribution to the rainfall of Lancashire. Again, in the case of the Pennines, it has been determined that rainfall on the whole is a function of elevation, and that the elevation has comparatively little effect during the summer and a greater effect during the winter

Similar investigations in regard to other geographical matters will be suggested in the next chapter.

CHAPTER VI

ARGUMENTATIVE GEOGRAPHY (*contd.*)

Vegetation. Exercises on vegetation and the products dependent upon vegetation may take one of two forms: they may be the results of personal observation on a school expedition, or they may be an investigation of certain data which refer to the vegetation of a small area.

Observational work will probably appeal to those pupils who have already done a considerable amount of botany, and will eventually take the form of a discovery of the plant associations which prevail upon the geological formations which outcrop near the school. Such work on ecology will, therefore, depend upon the particular circumstances of the school concerned.

Where botany has not been taught, or where the surroundings of the school are unsuitable, the study of vegetation may well take the form of a quantitative investigation into the whole circumstances connected with the growth of some crop, or the rearing of cattle or sheep. The subjects for investigation in this connection are so numerous that it will be impossible to do more than suggest in outline one or two.

Farming. In the earlier world survey the proportions in which various countries contribute to the world's supply of oats and other cereals have been worked out, the quantities of oats which enter into the trade of the various countries have been studied and the pupils have some definite notions of the conditions under which climatic factors regulate the growth of cereals. One way in which their knowledge can be increased is due to an investigation into the growing of oats in the world during the period since 1881. For this purpose, the acreage and crops of oats of the chief growing countries for each of the thirty years 1881–1910 are tabulated, and the average acreage and harvest for three decennial periods calculated. The pupils notice the countries in which the acreage of oats has decreased and the countries in which it has increased.

The proportion between world acreage and world harvest and the acreage and harvest of each country is then tabulated as a set of percentages. If the three percentages for acreage are separately divided into the three respective percentages for harvest, the quotients will be nearly equal. The pupils are asked to describe this quotient by the term *relative productivity*, and to note that despite progress in farming, and despite the increase in acreage in some cases and a decrease in others, the relative productivity of oats has been roughly constant for thirty years. When the pupils have seen these results, they can be introduced to the facts of similar import regarding wheat, rye, barley, maize and potatoes, and from these facts they will arrive at the generalisation that farming is a world industry, that the British farmer works in competition with the rest of the world, and that in the face of that competition he is the most successful farmer in the world, as he obtains consistently more produce per acre of ground tilled than any other farmer in any other country. It will be further obvious that certain countries farm with relatively the same success, e.g. France and Austria-Hungary are almost equally successful. Russia will be found to be the least successful of the large farmers, while the newer countries such as the United States and the Argentine tend to farm with about average success.

The pupil will then be in a position to estimate the importance of the work of the farmers in various countries, and will be ready to investigate the circumstances which tend to make the Russian farmer the least successful and the British farmer the most successful. He will be prepared to understand the difference between intensive and extensive cultivation, as well as the importance of adequate farm machinery such as is used in the United States in comparison with the primitive utensils in use in Russia. A second investigation may have reference to the circumstances under which the British farmer with a dwindling acreage and a commonly reputed failure to make farming a paying industry has managed to keep pace with world progress and maintain his high position in face of the keen competition of the newer farm lands of the fertile West.

For this purpose the pupil may be called upon to consider certain facts regarding an average English farming county such as Nottinghamshire: in such work he must perforce utilise the method of samples.

The geological factor in farming. The geology of Nottinghamshire is fairly simple, and details regarding the farm work of certain small areas within the county have been published[1]. These small areas consist of groups of parishes which are situated upon the same geological formation. It will be found that relative to the acreage of land under wheat for England the percentage of wheat land in Nottinghamshire has been roughly constant since 1870.

But it will also be found that the proportion of the wheat land of Nottinghamshire which has been provided by the various small areas has varied considerably. Without going into details it will suffice to state the general conclusions which the pupils will reach: these are (i) that certain formations, such as the Keuper marl, are more suitable for wheat-growing; (ii) that, in the case of Keuper marl, the farmers have tended to increase their relative devotion to wheat-growing; (iii) that, in other cases, the farmers have given up growing wheat when they found wheat-growing more difficult; (iv) in sum, the farmers of Nottinghamshire have tended to maintain wheat-growing on the lands suitable for wheat, and to cease to produce wheat on the poorer lands; i.e. the farmers farm up to the *margin of cultivation* and only farm such lands, as under present conditions of world competition, pay for tilling.

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[1] *The Geographical Journal*, Jan. 1914, pp. 34–61.

The poorer lands for each crop go out of cultivation, the relative yield of the lands which are still cultivated increases and therefore the British farmer maintains his pre-eminence by devoting his attention more and more exclusively to the best lands.

So soon as the pupils understand the term marginal cultivation they may be referred to the facts regarding wheat cultivation in New Zealand, where practically the governing factor in the work of the farmer is the question of the possibility of exporting wheat to Australian markets and obtaining sufficient prices for these exported supplies to pay for the cost of production and transport.

The rainfall factor in farm work. An investigation by means of pluviometric coefficients of the rainfall of the north-eastern portion of the United States may be carried out to make it clear that whatever crop be grown the farmer arranges his dates of sowing and reaping in such a manner that the plants always have approximately the same amount of rainfall although they are grown in different districts and although the growing periods differ in length.

The geographical nature of such studies. The reader may feel inclined to ask what connection such studies as these bear to geographical teaching. The prime consideration lies in the right understanding of the conditions which govern the farming industry not only in our own islands but all over the world: such studies are intimately related to the work and livelihood of a large proportion of the world's people and hence are truly geographical. Secondly, the food supply of those manufacturing countries which tend to be increasingly dependent upon imports of food-stuffs is a matter deserving the careful consideration of every future citizen, and it is well that the pupil should have some grasp of the complexities which arise in this connection. He should, moreover, have some notion of the methods which are to be adopted in the investigation of this complex of controlling factors. Thirdly, in the process of the work attention has been paid to other factors than that of climate in regard to farming. Some notice has been taken of the following circumstances: knowledge and skill of the farmers of different races, the effect of geological formations upon the crops produced, the effect of means of transport upon quantities of produce cultivated.

Cotton growing. During the transition stage the climatic factors which control the distribution of cotton cultivation have been determined, and at this stage it might be useful to carry the story of cotton cultivation a stage further along similar lines to those outlined above in regard to cereals. Such an investigation might be made in the interests of the people of Lancashire to determine some or all of the following questions: (i) the races of people upon which Lancashire factory hands depend for supplies of raw material; (ii) the geological formations which favour cotton production; (iii) the relative position of the United States as a grower of cotton in regard to past and future supplies, and the relative position under similar circumstances of the great competitors Egypt and India; the results would lead to the determination of a further question: (iv) how far the attempts to stimulate cotton growing in other lands are likely to be useful, and how long it will be before supplies from such lands can have an appreciable effect upon the cotton production of the world as a whole.

Mining. Emphasis has been laid upon the point that geographically the greatest importance attaches only to those mineral deposits which are at present worked; and in this connection the pupils might be asked to survey the conditions connected with the world's supplies of a mineral.

For many reasons, coal would appear to be the mineral of supreme importance and should, therefore, be chosen, but iron or copper might equally well be the subject of study. In this connection—say, in the case of coal—the pupils might determine the proportions in which the world's coal is now mined in certain countries: the proportions in which these mines contribute to the coal supplies both of their own and other lands, the effect which coal mining has had upon the work of the factory hands of the world, the effect which the present mines have upon the world's mercantile marine, and so on. Finally, it would be possible to investigate the conditions under which the various coal fields of the United Kingdom are at present worked, and the pupils might even go a step further and investigate the way in which the opening of collieries has profoundly affected the distribution of the population in Britain. Here, again, the method of sample could be utilised and the collieries of a small area might be studied in detail. For example, in the case of the Nottinghamshire portion of the York, Derby and Nottingham coal field it would be useful to make maps showing the distribution of the population of the people in the county of Nottingham in 1801, 1851 and 1901; and other maps to show the situation of the collieries which were at work at the same dates. It would, then, become obvious that the collieries had been a chief factor in concentrating the population in the south-west corner of the county. In order to make the pupils grasp more clearly this concentration, it might be well to construct models on the same lines as relief models to show by the height of the model the density of the population at the different dates.

From such a study of a single coal mining area the pupils would more readily appreciate the dependence of the manufacturing districts upon the coal-deposits.

Trading. Other studies involve the notion that the oceanic basins are clearing houses in which the commodities in which the world trades are as it were sorted in order that they may reach their respective destinations. It will be well to begin with an oceanic basin in which the traffic is comparatively slight, hence the first study might deal with the Indian Ocean. Goods which are carried over the waters of this ocean may be divided into three groups: those locally produced and locally consumed, where the term *local* refers to one or other of the shore-lands of this basin; those locally produced and sent outside the basin to be consumed; and those locally consumed and sent into the basin from other lands.

The study of these three classes of goods may be made purely descriptive or quantitative as the teacher wills. In the one case merely the names of the commodities will be considered, and in the second and more valuable work the pupils will attempt to estimate the quantities in which the trade is carried on in terms of the world as a unit.

The first class of goods will provide interesting facts as regards the tropical countries such as India and Ceylon and the cooler countries of Australasia. The pupils will notice that India cannot provide for her own needs and has to import tropical produce from neighbouring tropical lands ; and that some of the requirements of Australasians and South Africans can be met from India, etc.

The local coal traffic of this basin is of interest.

The second class of commodities will provide a convenient means of emphasising the chief facts regarding monsoon lands which have already been considered from another point of view, and the third class will show the degree in which manufactured goods are required in both classes of country.

Such a study will emphasise the points previously made with reference to world trade routes and will show the relative value of the Suez Canal and the Cape route eastwards.

Climatic controls of trade routes, even in these days of steamships, will be considered and the question of alternative land routes of traffic must receive attention. Finally, the study will close with the consideration of the reasons for the predominance of Bombay, Calcutta, Colombo, Singapore, Cape Town, Sydney and Melbourne as sea-ports and great cities. The second study might deal similarly with the Pacific basin and this might be followed with similar work upon the South Atlantic Ocean. Finally, the work would be crowned with a complete study of the North Atlantic basin and its arms, the Baltic and Mediterranean. This final investigation would serve to emphasise the fact that the eyes of all the workers of the world are turned on Britain, the centre of the world's commerce and the centre of the land hemisphere.

Few children could help being stirred very deeply by the picture of our comparatively miniature islands controlling and functioning the labours of the many millions of workers who toil and spin in lands both near and far. The dry bones of geographical fact would be clothed with the flesh of geographical generalisation until the conception of the world as an organism growing here and striving there, developing with great speed under one set of local conditions, stagnating under diverse conditions, had so become a portion of the mental equipment of the child that he has some right to be considered as a capable Briton, as a useful unit in the British Empire, and in the larger view, one of the proud denizens of that world whose romantic growth and power are to him no longer as a sealed book of mystery.

The pupil began by wondering, his curiosity was his greatest driving force; he proceeded by developing the capacity to comprehend, while his activity of brain and body forced him to acquire knowledge; his school career closes with a feeling of calm power since he has begun to grasp, as an organised whole, the work of the world. He is equipped to face the battle of life in the home land, where he can clothe the apparently sordid commodities of commerce with a romantic covering due to trained imagination which sees behind the grain of wheat the toiling thousands of the world's farmers, which views the knob of coal as a means of satisfying man's most intimate needs, and which passes in review the life-story of a single thread of cotton as one of the many strands which form the warp and weft in the life of man upon the earth.

As yet the effect of geographical environment upon religious and philosophic thought has not become a portion of the school course in geography, but the trained geographical mind cannot help but apply the methods and the principles to the study of any department of man's activities. The world is a unit, the concrete results achieved in one land to-day affect the life and work of millions in other lands; the ideas which produce this concrete result are the thoughts of men, and the thoughts of men function in relation to the environment in which they find themselves: to-day that environment is the whole world, and the interaction between the thinker and the world is a proper subject for geographical investigation.

History, politics, commerce, and science result from man's reaction to his surroundings and a training in geographical outlook is necessary to the historian, the politician, the man of commerce and the scientist no less as specialists than as ordinary citizens of this organic world.

CHAPTER VII

A CONSPECTUS OF THE GEOGRAPHY SCHEME

An ideal course. The course of geography outlined in the preceding chapters is intended to be ideal, and the complete adoption of such a scheme necessarily implies an ideal school, an ideal teacher and ideal conditions. Consequently, it has been judged advisable to set out a conspectus of the scheme in its broad outline so that the practical teacher who is faced by inherent difficulties in himself, his school, and his pupils, may readily adopt so much of the scheme as falls within the possibilities of his special circumstances.

DESCRIPTIVE GEOGRAPHY.

Matter.	*Apparatus.*
I. Introductory. Stories of a fairy tale type, about real people in a real world.	Plain black and white globe as a model of the world.
II. The main vegetation regions and the life of man therein.	(*a*) Map diagrams made from globe model. (*b*) Balloon photographs. (*c*) Advertisement pictures. (*d*) Latitude and longitude network. (*e*) Globe and lantern (p. 136).
III. Revision based upon the continents.	Map diagrams.
(*a*) Mountain, upland, lowland.	(*a*) Relief.
(*b*) Wet and dry areas.	(*b*) Rainfall.
(*c*) Distribution of population.	(*c*) Population density.

At the same time, the conspectus forms a useful starting-point for the succeeding chapters where it is hoped to discuss the geographical work of schools from a practical point of view in relation to the possibilities of various schools and schoolmasters.

The ages of the pupils. It will be advisable here to indicate that the course is designed to cover the whole of the geographical work of a secondary school and that the descriptive stage is roughly that of the Preliminary Locals, say, up to the age of eleven or twelve, the transition stage corresponds to the Junior Locals, say, up to the age of fourteen or fifteen; while the systematic portion of the final stage covers the work up to Matriculation Standard.

DESCRIPTIVE GEOGRAPHY.

Method.	*Relation of other subjects.*	*Outdoor work.*
I. Emphasis to be laid on broad contrasts and on a personal element which shall decrease in intensity.		
II. Description of lands showing broad views of climate and vegetation together and the kind of life men lead.	*Drawing.* Reproduction of pictures of (i) valleys, (ii) hills, (iii) typical houses, etc. (from photographs of the real things).	Places seen on holiday trips, etc. Sun altitudes. Observation of trees.
III. From the globe to the map and then the continent described as a home of man and attention paid to some reasons why men are crowded here and scattered there. Some attention again to the work men do.	*History.* Palestine, Greece, Early England.	

TRANSITION GEOGRAPHY.

Matter.

I. The "shorthand" of Geography.
II. Methods of inquiry and statement of results.
III. Geographical principles.

Matter and apparatus.	I. "*Shorthand.*"
(A) Triangulation: plane-table.	A small-scale map.
(B) Relief: models, sand hills in playground, etc	Contour lines. Hachures.
(C) Climate: thermometers, etc.	Isotherms, etc. Graphs, etc. Seasonal percentages and variations.
(D) Vegetation: distribution maps, quantitative data.	(i) Graphic diagrams. (ii) Distributions: (i) present or absent, (ii) quality, (iii) quantity.
(E) Human labour. (i) Farming (ii) Lumbering (iii) Mining (iv) Fishing } country life. (v) Manufactured articles } town life.	Pictures or lantern slides to illustrate each product. Models or maps showing the contrast between country and town populations.

TRANSITION GEOGRAPHY.

Area.

I. The Home land.
II. The Shore-lands of the North Atlantic Ocean.
III. The World as a unit.

II. *Methods.*	III. *Principles.*
(A, B) The gradual progress to the interpretation of an Ordnance Survey map.	The mathematical principles underlying similar figures.
(C) (*a*) The gradual acquaintance with the representation of numerical climatic facts. (*b*) The investigation of the evidence for the regions of monsoon or winter rains.	(i) The principles underlying the world's great climatic regions. (ii) Some reference to the "physics" work and its principles.
(D) (*a*) Relative quantities as a test of importance. (*b*) The distribution of a product in relation to climate.	Men tend to produce in order: (*a*) animals, (*b*) vegetable products, (*c*) fishery and mineral products, (*d*) manufactures, in relation to the main vegetation regions of the world.
(E) A summary of the "work" regions of the world as deduced from: (*a*) Population density, (*b*) Climatic-vegetation regions, (*c*) The age of the country in reference to the "Industrial Revolution."	Coal and easy communications make for density of population. Farming, etc. makes for a scattered population.

Matter and apparatus.	I. *"Shorthand."*
(F) Applications of (A) to (E) in specific reference to the British Isles and the neighbouring lands.	All kinds of maps on these countries.
II. *Methods.*	**III. *Principles.***
(F) A consistent study of each country taken under the heads of: (i) Position. (ii) Relief. (iii) Climate. (iv) Vegetation. (v) Products. (vi) Minerals worked. (vii) Manufactures. (viii) Communications from which to divide the country into definite areas which have each a greater or less regional individuality.	The verification of all the previous inductions by deductive checks.

SYSTEMATIC AND ARGUMENTATIVE GEOGRAPHY.

Material from any trustworthy source: collections of first-hand observations; Census reports; official Blue Books; consular reports: results of special investigations; newspaper summaries, especially in trade journals.

Classes now do sectional work; it is no longer essential that each pupil complete the whole investigation regarding a country himself; he trusts his classmates.

Systematic survey of the world. For each country an inquiry into :

- (i) position and world relationship,
- (ii) size and population,
- (iii) climatic world relationship and special regions,
- (iv) vegetation regions,
- (v) relief as a control of the special local conditions of climate and vegetation,
- (vi) the work the inhabitants perform, investigated in regard to their produce and its relative importance to the produce of competitors,
- (vii) local consumption and home trade.
- (viii) external consumption and export trade,
- (ix) communications in relation to :
  - (*a*) relief,
  - (*b*) the sea,
  - (*c*) the areas of production and consumption,
- (x) the growth of the nation ; its historical significance in special relation to its present importance (Chap. II).

Argumentative geography : typical examples of geographical arguments as a check upon the pupil's acquaintance with geographical principles and as a provision of practice for the pupil in

- (i) outlook—world survey,
- (ii) inlook—grasp of the significance of details,
- (iii) sidelook—conception of relative importance.

Suggested examples:

(i) land forms and the cycle of erosion—an introduction to physiography,

(ii) the special climate of Britain in relation to oceanic influences—an introduction to oceanography,

(iii) the special conditions which suit the produce of cotton (say) on a large scale—an introduction to (*a*) plant physiology, (*b*) the economics of production and marketing of commodities,

(iv) mineral deposits and why they all occur and are worked—an introduction to (*a*) geology; (*b*) the economics of production, etc.,

(v) ocean basins as trade clearing houses,

(vi) the complete investigation of all the main and subsidiary processes in connection with a commodity, e.g. artificial manures, and their utility,

(vii) the circumstances underlying the development of any industrial district: why the people are there and why they remain there, as well as the consequences of their aggregation.

Systematic geography aims at obtaining a coordinated body of fact.

Argumentative geography aims at providing illustrations of the "explanation" of certain types of facts.

CHAPTER VIII

GEOGRAPHICAL EXPLANATION

The nature and extent of a theoretical explanation. The conspectus of the work which may reasonably be called "school geography," which has been considered in the last chapter, leads naturally to the discussion of matters of practical importance. The most important of these matters, from the point of view of the teacher when face to face with his class, consists in the determination of the nature and extent of the explanation which is to be provided by him, or to be obtained from his pupils, whenever he passes beyond the bounds of precise facts. The pupil should be ready with some explanation of the **why** and **how** and the **how much** which he has observed in connection with some fact in geography. The difficulty is not, however, that some explanation is not forthcoming, but rather where the explanation is to stop. What is the criterion of the value of the explanation offered by a pupil ?

An example. Let the special nature of this difficulty become apparent from the following special case, regarding the explanation of the localisation of the greatest cotton manufacturing district in the world in the area of country of which Manchester is the centre.

The cotton industry of south-east Lancashire is localised in that district because there occur in that district (i) the suitable climate, (ii) the adequate facilities for development of power and for the supply of raw material and for the marketing of the product, and (iii) the requisite number of capable work-people for the factories.

This explanation may serve as a first attempt at a reply to the question at issue, but the poverty of the thought behind the apparently elaborate phraseology is obvious when it is remembered that such an explanation would apply with almost equal exactitude to the hardware industry of the Midlands or to the jute work of Dundee.

Explanations are, therefore, inadequate unless they enter to some degree into the special and unique features of the matter under examination; the general outline of the explanation may be deduced from geographical principles but the filling in of the outline must betray an intimate knowledge of the special circumstances of the particular area or district in which the conditions occur.

The explanation may then be expanded into something of the following type. The cotton industry is localised in Lancashire because:

(i) the humidity of the atmosphere renders the district specially suitable;

(ii) the coal supplies of the neighbourhood are adequate to the needs of the factories; the situation of the district within 40 miles of the sea-coast makes it possible for supplies and products to be transported cheaply, and the situation of the district within England—the country which has the largest merchant shipping service in the world—makes it possible easily to sell the goods when they are manufactured;

(iii) the district is crowded with people who have inherited from previous generations the necessary skill to attend to the cotton machinery.

The additions to the suggested explanation which appear in the above statement consist almost entirely of facts; and for purposes of school work the knowledge of these facts is not so important as the method by which the facts have been acquired. If the facts have merely been learnt by heart from the text-book or from the teacher's talk, the explanation is of little value although it may be perfectly adequate when considered apart from school work.

The nature of the evidence. The value of the explanation lies therefore not in the statement of facts, even in conjunction or in opposition, but in the evidence which is adduced for those facts.

Consequently, the problem to be solved lies now in the nature of the evidence which is to be expected from a school pupil in support of his statements.

(i) Humidity.—There is little or no direct evidence from the records of meteorology that south-east Lancashire is specially humid, so that the pupil has to rely upon such indirect evidence as the statement of the manufacturer of cottons in a comparatively less rainy area than Lancashire: "I cannot spin the finer counts of cotton; to spin as fine cotton as possible I have to surround my factory with canals and standing water, to keep the air humid." A variant of such an explanation may arise from references to the nature of the conditions under which the cotton fibre has a maximum tensile strength, and to the geographical evidence by means of isohyets for the raininess of Lancashire as conducive to these humid conditions.

(ii) Coal.—It will, perhaps, be sufficient for the pupil to point out the generalisation that in the United Kingdom the factories and workshops are all located on or near the coal fields, and hence cotton manufacturing is to be expected upon one or other of the British coal fields.

(iii) Supplies.—The evidence to be adduced here consists of some reference to the quantities of raw material brought into England, to the countries of origin of these supplies and to the growth of Liverpool as a port, and to the specialisation of Liverpool in the traffic with the United States in particular.

In connection with this matter reference will be expected to the development of transport facilities in Lancashire itself; to such facts as the Bridgewater Canal, the Manchester Ship Canal, the earliest Liverpool to Manchester Railway and to the Lancashire and Yorkshire Railway as the most important railway in the United Kingdom which has not a terminus of its own in London, and, further, to the comparatively close network of railway tracks throughout the area, so that no portion of the district is now more than five miles from a railway track, and so that there is a mile of railway track for each 2000 of the population.

(iv) Marketing.—In addition to some references to the home consumption of cotton goods, the pupil should make some statements of the relative importance of British exports of cotton in comparison with cotton exports from other countries to the markets of India, China, etc., and to the fact that the Indian market is largely controlled by the political circumstance that India is a British Dominion.

(v) People.—Reference is necessary in this connection to the facts (*a*) that Lancashire has steadily increased the density of its population at the same time as the cotton industry has been growing, that the majority of the workers of Lancashire are somehow connected with cotton and that the majority of the cotton workers of the United Kingdom live in Lancashire, and (*b*) that the skill of Lancashire workers is so highly developed that they can operate more machines than other workers and that they are chosen as teachers to travel to other lands to instruct and supervise manufacturing processes in new cotton districts.

It will be clear that so extended an explanation as is here outlined calls for skill and energy on the part of the teacher. It becomes his duty to select the material and guide the comparisons upon which these statements are based. He must direct the attention of the pupils to the sources of information, wherever they exist, in such a way that the pupils arrive at the necessary conclusions and observations which will permit them to appreciate the validity and the necessity of the statements in the explanation.

The transition stage. The pupil's work during the transition stage should be so arranged that he meets in due course with the conventional presentations of the kinds of information which are here requisite, and that he infers, during his experience of these studies, facts which will be useful at a later period when the whole work is passed in review in order to determine the conditions under which Lancashire has specially developed in this respect. The decisive factor in the selection of material for the pupil's work in the transition stage is this condition: the work so done shall have direct preparation for later work. Obviously, therefore, explanation in geography is progressive: the child may learn the broad facts at first and then, later, may read into those broad facts some of their content, some of the content which they hold for the matured trained geographer. Consequently, explanation should be carried, in some cases, as far as possible, so that the pupil may learn that even in geographical matters a limit of knowledge is reached because men have not yet studied the matter more deeply.

The argumentative stage. The argumentative stage is occupied with the intensive development of the explanation of a few geographical phenomena; and the Lancashire cotton trade has been taken as an illustration in this chapter solely because its intrinsic importance is such that it provides perhaps the best example of a set of circumstances which demand the fullest possible explanation.

It may be well to suggest the steps by which the explanation may be pushed to its limit.

(i) Humidity.—The geographical factors which control the wetness of the atmosphere in Lancashire seem to be fundamental and accidental. The fundamental condition lies in the situation of Lancashire in regard to (*a*) the Atlantic Ocean and the wind directions in reference to the sea · (*b*) the relative temperatures of the air above the ocean and the air over Lancashire; the position of Britain on the western margin of a continent in a high latitude.

The accidental conditions are due to the geological history of Britain, which has resulted in (1) the Irish Sea. (2) the Cambrian Upland, (3) the Pennine Upland and (4) the special shape of the basin of the Irwell, in relation to the erosion which has resulted in the Lancashire Plain.

The work of the teacher in regard to these facts appears to lie in directing the attention of the pupils to the data from which these circumstances appear in all their fullest importance. The position of Britain and the warmth of the air over sea and land involve reference to the isanomalous temperatures of the North Atlantic Ocean, and the air and sea temperatures imply attention to the Pilot Charts of the North Atlantic Ocean where the observed facts are summarised: and, finally, the wetness of Lancashire requires a consideration of the lines indicating pluviometric coefficients for North England in special relation to the actual air isotherms for the same area for the same months.

The accidental conditions due to the shape of the Irish Sea, the shape of the Uplands and the water-parting of the Irwell basin, become clearer in relation to a study of the geological history of the area.

(ii) Power.—This is related both as regards the original supplies of water for power and for the manufacturing processes, and as regards the supplies of coal in modern times, to the geological history to which reference has just been made.

(iii) Supplies of raw material.—In connection with the question of cotton supplies the pupil will be led to the consideration of the chronological facts regarding the development of both cotton-growing and cotton manufacturing. The relation of Liverpool to trade with the West Indies and with the United States in competition with Bristol, the circumstances in which the United States came to be the premier producer of cotton, the importance of Indian and Egyptian cotton for certain processes, the development of the chemical industry in relation to Cheshire salt, are all matters which fall into perspective in this inquiry, and at the same time the quantitative nature of the facts which are determined will enable the pupil to estimate the immediate relative importance of the efforts at cotton-growing which are being conducted in different parts of the British Empire.

(iv) Marketing.—Here arises the importance of the story of canal development until 1851, the consequent rise of railways so that they have grown in steady ratio to the growth of population, i.e. of workers, and have been for many years steady at about a mile of track per 2000 of the population. Finally, the whole development is intimately related to the growth of the mercantile marine and to the stages in that growth, to the changes from sailing to steam ships, from wooden to iron ships, from paddle steamers to those driven by one or more screws, and to the developments of marine boiler construction.

In this connection, the work of the teacher will more than ever consist in making the facts which are required for study readily available for the pupils. To a large extent his work will lie in the provision of a mass of information in manuscript, and in the guidance which he thereby provides for his pupils.

(v) People.—Here the work lies almost entirely in connection with the reports of the Census. The details of the growth of the population of south-east Lancashire in comparison with the depopulation of the farm districts in its immediate neighbourhood should be made clear by means of a series of maps showing the distribution of the people at the individual Census years. The rates of growth of the two kinds of districts should be studied so that the year of crisis, 1851, should be definitely determined and definitely related to progress in transport and communications. The conditions of the population in the Lancashire area should be shown so as to determine clearly that beside the usual natural increase of the population in Lancashire there was a steady influx of workers into the factory districts, and that these workers were of such an age that the proportion of young people steadily increased in the factory districts and steadily declined in the farming districts.

At this stage the bulk of the work of investigation will fall upon the teacher, for at the present time the amount of available published information on this subject is but small, and the copies of the early Census reports to which he could provide access for his pupils do not exist.

This complete study of what is meant by explanation in geography is definitely intended to have immediate and special reference to the growth of the knowledge of the pupil, and to his training in methods of geographical inquiry. There is no intention that it shall have any reference to geographical explanation as required in the answers to examination questions; this subject will be referred to later, at the moment it will suffice to say that the modern practice of requiring an examination candidate to explain geographical factors in a general way serves only one purpose of doubtful utility—to stimulate the memorising of verbal descriptions placed before the pupil in text-books or in notes provided by the teacher.

Twenty minutes is not sufficient to allow of a thorough explanation of many geographical matters, and any explanation set out without the evidence upon which it is based is merely verbal and is not necessarily a test of geographical knowledge or insight. The test of power to grasp geographical explanations lies not in the power to reproduce words or sentences, but in the power to elucidate given facts in relation to specific pieces of geographical information.

CHAPTER IX

REGIONAL AND ECONOMIC GEOGRAPHY

Different geographies. Strictly speaking, from the point of view of the schoolmaster, there is but one geography—the geography which he knows and can teach. Be he never so cautious, never so level-headed, his work will always have a definite bias; without that bias, which presents his own individuality, his work would lose half its value. Yet in writing about "Regional," "Economic," or "Physical" geography one is apt to consider the subject-matter of geography apart from the teacher; and the question naturally arises: "Is there a regional or a political geography?" The reply to such a question evades the difficulty by stating that no such subdivision of geographical knowledge into separate compartments can exist. The reaction between man and his environment is universal and when, for teaching purposes, we lift one aspect of a reaction from out its complex and examine it minutely, we attend to something which does not really exist, something which is divorced from its surroundings, something which to some degree has lost in geographical importance. The prime factor in the reaction under examination may be a climatic region, or it may be an economic circumstance, or a political boundary, or the strategic situation of a city; but although our interest may be chiefly concentrated on one of these aspects of the question for the moment, and although we may be accused of teaching regionally, or economically, or politically, yet we fail as teachers if we neglect to call into line towards the close of the discussion the other aspects of the subject which have up to then been ignored.

"Regional" or any other geography is but the name given to a method of presentation of geographic truth in which a definite aspect is emphasised.

The regional point of view. Climatic conditions have no respect for political boundaries, hence some countries form part of an area which has a distinct and definite climate sequence of its own, e.g. the British Isles forms part of the climatic region of the North-east Atlantic shore-lands. Other political units, such as the United States, contain the whole of some climatic regions and portions of others.

This fact is in itself a justification for the teaching of the climatic regions: for it causes the pupil to think of an organised world in which there occur certain areas which are intimately bound up with other areas, and where the chief source of identity lies in the factors which govern men's activities. When the pupil grasps the division of the earth into climatic regions, when he has realised the essential similarities which are presented by the winter rain regions where-ever they occur, and when he has carried this subdivision of the world onward to the interpretation of the main vegetation features of the world, then the pupil has grasped the best that is to be obtained from the regional point of view. When his conception of a world so organised and so ordered is emphasised by reference to the swing of the sun (or, if you will, to the tilt of the earth) and to the earth's rotation, then his view of natural phenomena is quickened by the sense of orderly sequence, and he is prepared to carry the geographical interpretation of the life of man to its legitimate conclusion.

Such is the prime utility both in study and in teaching of the regional conception.

The knowledge of differences. Once the world conception is grasped, the pupil is ready for further study, and further study in geography, as in other sciences, refers to the discovery and explanation of the more minute differentiae which arise in connection with a broad generalisation. The winter rain regions of the Mediterranean are not identical in natural phenomena with those of the Western United States, and they are, therefore, not identical in their effects upon the life of man ; and progress in geographical knowledge can only come in this connection by the study and explanation of the differences which exist. Man's adaptation to similar conditions differs according to the men who inhabit the different areas, and, hence, the products of the regions of winter rain are similar in broad outline but different in relative importance and sometimes different in kind.

Hence, the importance of what may be called the economic point of view.

The economic point of view. Bound up with the organic conception of a regional world lies the organic conception of an economic world. But the conception of an economic world rests upon an immediate separation of men into two great groups, firstly, the men who are self-centred, and secondly, the men whose livelihood depends upon the lives of other men in different walks of life for whose needs they cater.

Between these two great groups there are, of course, intermediate groups of men who are neither definitely self-centred nor definitely dependent upon others. The point of view of economic geography causes all the emphasis to be laid upon the dependent men, to the comparative exclusion of the others. The pupils grasp the general principle that man adapts his life to his environment, and, therefore, in regard to a simple self-contained community, the pupil is prepared to argue that when he learns in what fashion such men live, he can point out the geographic controls which limit the activities of these men. Be they nomad steppe rangers, or isolated Eskimo, he has little doubt that their lives are ordered by their environment. Consequently, such groups of men are treated in the geographical story of the class-room in relation to the regional conception, and as illustrations of the conquest of man by nature. The dependent men, on the other hand, differ in degree and kind from the self-contained, their lives are passed in the conquest of nature by means of co-operation; their progress is part of the world's progress, their work is performed in relation to the immediate surroundings in which they live but also in ordered relation to the world as a whole. The elucidation of this co-operation, this ordered progress, is the justification of the economic point of view.

The importance of economic geography. A knowledge of the facts of economic geography is valuable to the majority of adults—the business man, the engineer, the scientist, has at some time or other to know some economic facts, or has to know how to find out certain facts of this class, hence economic geography has a value apart from its value as a branch of study. Many teachers, no doubt, feel that economic geography is, on this account, but a " bread and butter " subject, and is therefore to be contemned. Such a view is based upon a misconception. Economic geography grows out of that portion of regional geography which is related to the lives of men in certain portions of the world. Within the last thirty years or so, the Commercial Revolution, which is the successor of the Industrial Revolution of the preceding hundred years, has defined the path humanity treads. Some men produce useful articles in iron and steel, they have no time to farm ; other men do nothing but farm for wheat and wheat alone. Why ? Because they can sell their produce in the world's markets and earn a livelihood. The Commercial Revolution implies world trade, world transport, world co-operation ; it implies that the world as a whole is benefiting by the fact that everywhere men are engaged in producing those articles which the world as a whole needs, and which they can produce relatively more cheaply than any other body of men in other parts of the world. Everyone is co-operating to supply the needs of the world at the least cost to humanity.

The progress of the Commercial Revolution means the reign of order, and hence the pupil who grasps the fundamental conception of economic geography examines the world from a new point of view, and sees in the flying shuttle, the clanging hammer, the whirring harvester, the lumbering train and the steamer trailing its cloud of smoke, a visible element in the harmonious conquest of nature which has been the work of civilised man.

Argumentative geography. The problems of economic geography relate to questions of the degree in which this, that, or the other area sends its quota to supply the need of civilised men. The use of the word quota in this connection defines at once the attitude of the pupil: at first, the broad outlines of human activities may be described, but the moment he probes beneath the surface his work becomes quantitative, he begins to estimate degrees of relative importance, his problems are related to differences in degree and much of his work therefore becomes argumentative, i.e. scientific. He investigates facts and draws conclusions for himself.

Geographical constants. On the assumption that the world's work is orderly and not capricious, that human progress is steady and not haphazard, it might be argued that the relative proportions in which men worked, and the relative amounts of the produce which they obtained would be constant: and it is the function of economic geography to demonstrate that such constancy exists. Yet at the same time, it is important to indicate that changes may take place and to investigate the causes of the changes from the constant relationship which have occurred or are in progress. An illustration will make this point clearer. Evidence can be accumulated that wheat-growing has been more successful in recent years than formerly: the world has progressed. More wheat has been needed and more wheat has been forthcoming. Evidence can be adduced to show that throughout the progress has been of two kinds, in area of land cropped and in yield per acre. At first sight it would appear that such circumstances do not suggest any constancy, yet evidence is available which shows that the yield per acre has progressed throughout the world for thirty years at the same rate: the Russian farmer produces more wheat per acre now than formerly, yet he produces no greater yield proportionately than the farmer of the Eastern Counties or the farmer of the prairie lands of the United States: progress in yield per acre of cereal crops has occurred at the same rate among all the farmers of the world.

At the same time the acreage under wheat in England has declined and the acreage under wheat in Canada has been extended, and it becomes a problem to indicate the reasons for these changes and to attempt to discover the possible trend of the changes which are in progress and their possible limitation so that human progress in the future may be facilitated.

We emphasise a point of view in our studies and in our teaching in particular relationship to the aspect of human endeavour under investigation, but further studies take us beyond our immediate original outlook, e.g. when we wish to foresee the limits of wheat expansion we must undertake inquiries into the nature of the relief, soil and climate of definite areas, which are in themselves dependent upon emphasis of other aspects of geographical study.

CHAPTER X

QUANTITATIVE WORK

Quantitative investigations. Since it has become clear that geographical explanation depends for its value largely upon the methods which are adopted to discover the facts upon which the explanation rests, there is no need for any excuse in demanding from the pupil some facility in dealing with quantities. Many adults pass through life with a distaste for figures, they are little inclined to take any pains to master quantitative methods, they glance through numerical statements of fact and then turn to something which has a more definitely literary flavour. On the other hand, numbers appeal to some minds, they revel in figures, a tabular quantitative statement is replete with facts and appeals to them. The pupil may have one of these predilections slightly developed, but he should leave school with such an outlook on life that if he is by character interested in literature he should be interested in numbers by training, and conversely. The man who abhors numbers has been badly trained at school. Practical experience demonstrates that there are very few boys indeed who fail to respond with a definite zest to the suggestion that the quantitative method is the only safe method by means of which to determine geographical facts with any approach to precision.

Consequently, it is necessary that pupils should have some notions of size and relative importance, and should have some recollection of quantitative values. There is no method so useful towards the appreciation and remembrance of quantities as that of performing some kind of work with the quantities.

An example of the necessity for quantitative work recently arose in connection with the world's wheat growers The writer had to examine candidates for school scholarships, and in reply to a question: "Specify the wheat-growing areas of Europe and North America," it was found that the majority of the pupils regarded Canada as the most important wheat producer in North America. This lack of definite perspective in regard to facts is typical of many pupils and also of many adults; few people realise the relative importance of wheat in the United States in regard to North America, in Western Europe, i.e. France and Germany, in regard to Europe as a whole and in Canada in comparison with India and Australia.

Stages in the development of school geography. Geography, as a school subject, is now reaching a third stage of development; the first stage occurred when geography was largely topographical—we meet the relics of this stage when parents or business men criticise modern geographical teaching by such a statement as "a boy ought to know where Petrograd is." The essential thing is that a boy should know how to find out where the city is located, and having found out where it is, should immediately know a good deal about Petrograd because of its situation. At the topographical stage the child had to remember two facts, (i) where a place was, and (ii) what the place was noted for; and there was in his mind no necessary connection between the two facts.

The second stage is the qualitative stage, when pupils were instructed that certain regions occurred in the world, and that certain products were localised in those regions, etc. This qualitative knowledge would allow a child to know that sheep were reared upon the hilly uplands of England, that from these sheep woollen manufacturers obtained some of their supplies of raw material. But the third stage involves a more accurate and a measured knowledge from which emerges the fact that the island of Great Britain in relation to its size is probably the best sheep-rearing country in the world, not beaten by so favourably situated a country as New Zealand which has but one great occupation of the people, that of rearing sheep. The basis of quantitative work is comparison with a unit, and the essence of modern geographical teaching should lie in the comparative habit of mind which it produces in all pupils. Hence the necessity for quantitative work.

Modern geographical teaching should aim at causing the pupil to make generalisations for himself. Now the inductive process depends no less upon the importance of the examples considered than upon their number, in fact, an induction from three or four cases of predominant importance will probably be easier to make, and more correctly made, than an induction from a multiplicity of cases of smaller and even of minute importance. The test of importance is therefore essential, and the test of importance cannot but be numerical.

Three kinds of quantitative work. The excuse, if excuse be needed, for quantitative work lies then upon three grounds: (*a*) as a means of memorising certain quantitative notions: (*b*) as a means of comparative study, and a test of true emphasis upon geographical conditions; and (*c*) as an aid in the inductive process. Corresponding with these three reasons for numerical work, there are necessarily three points of view behind the use of definite sets of quantitative information.

Memory. The first kind of quantities which are required are those which are concerned with the geographical conventions. For example, no pupil should be expected to use maps showing isotherms, isohyets, etc., until he has attempted to make such a map. Whereas an adult might be able to appreciate a map line indicating isanomalous temperatures, a child is unable to grasp the meaning of an isohyet until he has attempted to make one. But the construction of a map showing isotherms and isohyets involves some conception of the averages used in geographical work; a rainfall average is quite a different quantity from a temperature average. The variation of an individual number from the average rainfall for a place may be as much as 200 %, but the variations which are smoothed by an average temperature are much closer to the average. Again, rainfall is a total and temperature but a level. Consequently, the pupil should calculate rainfall and temperature averages and should make isohyets and isotherms on a map.

Similarly, with reference to a distribution map of certain products over the world: no pupil should use such maps until he has made one or more for himself; and since all countries which produce this commodity are not equally prolific, he should make his map from a table of numerical values and should be encouraged to neglect those countries of relatively small importance

Finally, from this point of view, some work should be done on those quantities which the pupil is expected to remember, not as absolute numbers, but as numerical relations. We speak of the regions of monsoon, winter and ordinary summer rainfall. The pupil should have calculated from tables showing the average rainfall for the months the seasonal percentage rainfall for so many places that he is prepared to state that monsoon rainfall occurs at those places where about 60 %, at least, of the rainfall occurs during the three hottest months, and that winter rains occur at those places where about 40 % of the rain falls during the three coldest months. It may be expected of a pupil in the transition stage that with reference to the peculiar winter climate of the British Isles he should know what is meant by a January isanomalous temperature of + 40° F. It is not a difficult exercise, given a map of the world showing average January temperatures, to construct a map of the North Atlantic Ocean showing January isanomalous lines. The quantities handled in such an exercise are of little consequence, but the result that the winter temperature of the air over the sea to the north of the British Isles is more than 40° F. above the average for the latitude is a matter of great consequence.

Again, we expect the pupil to remember numerical facts about the world commodities, e.g. that the United States produces about 60 % of the world's cotton, or that Germany and India produce respectively about one-third each of the world's beet and cane sugar. These facts are to be gathered from the consideration of tables of numerical values and the pupils are trained to appreciate them by a gradual development of which the stages are as follow.

(1) The calculation of percentages. Percentage values for geographical purposes need only be accurate to the nearest integer, and pupils who gain experience are frequently able to write down the percentages to this degree of accuracy. Should this not be so, it may be useful to use the method of Fig. 1, p. 43, embodied in a home-made piece of apparatus. Paste a sheet of squared paper on a thin sheet of cardboard, and mark a horizontal scale along the paper from 0 to 100. Take a piece of squared paper about an inch wide and nearly as long as the diagonal of the cardboard. Cut a slit about $\frac{1}{4}$ inch wide along the middle of this strip, leaving about an inch at each end of the strip without the slit. Mark the slit at one end zero. Now it is required to find what percentage 745 is of 2306. Mark along the slit a convenient scale so that the number 2306 on the scale is near to the other end of the slit from the zero; let us call this point *A*. Mark on the scale the number 745, and let us call this point *B*. Place the zero of the slit on the zero of the horizontal scale, and lay the slit on the squared paper so that the point *A* is vertically over the 100 on the horizontal scale; the slit then lies in a slanting direction across the squared paper. The number vertically below point *B* on the horizontal scale gives the required percentage. This graphical method is not so quick as the ordinary arithmetical calculation for one number, but when the slit is fixed in position it is possible to read off

many numbers as percentages of 2306 and consequently its use for the percentaging of a table of values ends in a saving of time.

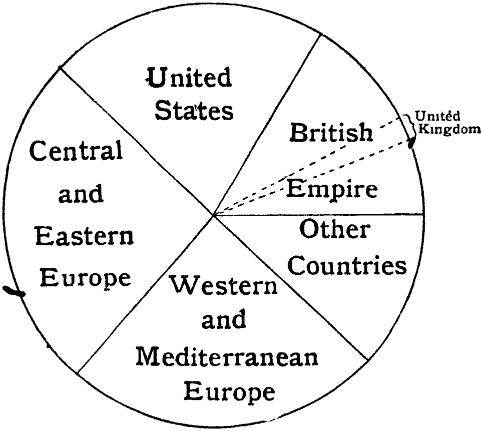

Fig. 4.

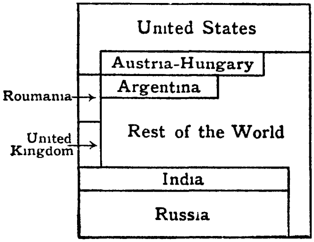

Fig. 5.

Diagrams illustrating the World's Production of Wheat

(2) The construction of diagrams to illustrate the facts. At an early age $\frac{1}{4}$ as a number does not impress the child so strongly as a shaded portion showing $\frac{1}{4}$ of a circle or a rectangle, consequently,

for some time the pupil should make diagrams to illustrate his percentages. In making these diagrams, he should be limited to a few divisions of the circle or rectangle, and this limitation will force his attention to the more important countries.

(3) Representative fractions. The pupil should be required to state for each portion of his diagram a simple fraction which expresses roughly its relative proportion to the whole diagram.

Comparison, and measurement. The second stage of quantitative work depends upon numerical comparisons with a view to ascertaining relative importance both as regards the facts of geography and the conclusions to be deduced therefrom.

For example, consider the grass-lands of the world in relation to the lives and work of the people who inhabit them. The pupil has attained a conception of the world's grass-lands as a great region determined in character by its peculiar climate and by the resultant vegetation. Now this knowledge is of little value in itself, the knowledge which matters is the knowledge of the use which men make of these grass-lands; and the study of the quantitative maps of the great grass-land areas will lead to the following generalisations:

(i) Men who occupy the grass-lands first use animals and then cultivate cereals: they rear first sheep and then cattle for meat purposes, later cattle for dairying: the cereals which are produced depend upon the markets which these people can reach with their cereal supplies, and upon the atmospheric temperature of the grass-lands in which they live. All this general view of the work on the grass-lands is summarised by the term "prairie farming."

(ii) Prairie farming is extensive, because there is more space than population, and hence men have developed all kinds of mechanical devices to facilitate their work and render them capable of producing great quantities of material with a relatively small amount of human labour.

(iii) In addition to these mechanical devices which are in use both on the farms and during the transport of the products, there is a certain amount of seasonal migration of labourers to work on the prairie farms during the short periods of the harvest when human labour is at a premium.

These inductions will follow from a quantitative study of the farm work on the grass-lands in comparison with the quantitative work on the farms of Western Europe.

Relative importance. Nowadays, the work of any set of labourers upon the land is valuable from a double point of view · valuable to themselves as a means of earning a livelihood and valuable to the rest of the world as providing supplies of commodities necessary to the work of the world. This dual conception is capable of quantitative treatment. For example, it is desired to know what are the best farming districts of the United Kingdom, in special reference to the production of wheat: the data obtainable are of two kinds relative to yield per acre and relative to total yield. Now if the pupil makes a map of the United Kingdom to show those counties in which the average yield per acre of land laid down in wheat is the highest, he will find that several districts in Scotland are among the best districts in the United Kingdom; if, on the other hand, he makes a map showing the counties which have the largest total yield in relation to their area, he will find that these Scottish counties are of relatively small importance. These Scottish farmers grow a small quantity of wheat, but they grow it easily; so that wheat to them is of greater importance individually than the quantity of wheat they produce is of importance in regard to the food supplies of the people of the United Kingdom as a whole. Somewhat similarly in regard to the grass-lands of South Africa, there is a certain amount of farm work done upon the veld, but the net result is so small relatively that the produce obtained is not sufficient to provide for the wants of the million or so white men who inhabit British South Africa, and food supplies have to be imported from the Argentine and from Australia. The veld therefore sinks into a grass-land of little importance; in fact, its relative importance is little greater than that of the steppe land to the south-west of Siberia.

Migration of the population. The distribution of people both at the present time and during previous decades is a quantitative matter of supreme importance. For example, consider the population changes which have occurred in the neighbourhood of Manchester and Leeds. During the last century the population in the factory districts of the Southern Pennine area has increased by sometimes as much as ten times, the normal increase throughout the century is steadily at a rate of about 100 % per 25 years.

Meanwhile, the agricultural districts in the same neighbourhood, despite the fact that this steadily increasing population provided the farmers with an

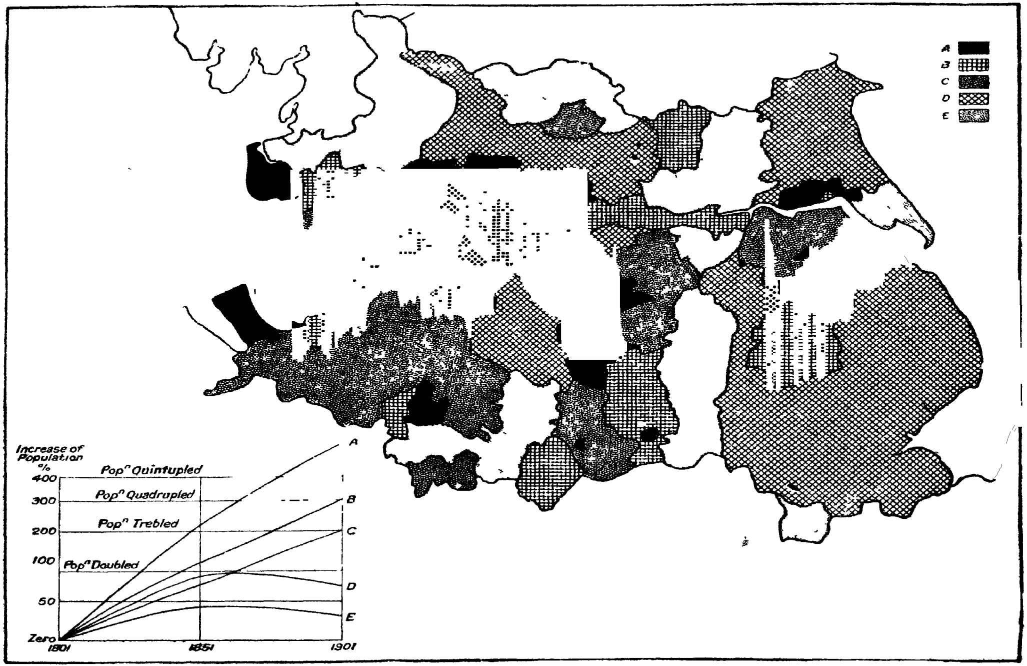

Fig 6. Population Changes during the Nineteenth Century in the neighbourhood of the Southern Pennines.

immediate market for their food-stuffs, have increased throughout the century usually by less than 100 % in the 100 years, and in many areas the numbers of the people are less now than they were in 1801 (Fig. 6).

Now this fact bears close relation to the argument which sets out the factors which have tended to make south-east Lancashire the greatest cotton manufacturing district in the world. It may be very important that supplies of raw material can be obtained with ease from America, since in the quaint phrase of a generation ago, Lancashire "faces America." It may be equally important that the humidity of the district is specially suitable for the processes of manufacture, so that in the phrase of the business man "the climate of Lancashire is equal to a 7½ % dividend on capital expenditure," it may be that the nearness first of water-power and later of coal-power has contributed greatly to the development of industry, but these facts, important as they no doubt are, fade into insignificance in comparison with the fact that conditions of life in England have been such that workers could be obtained as required to "mind" the looms and the spinning machines. The aggregation of this dense industrial population in the Manchester district implies a correlative thinning of the population elsewhere, and one prime cause of this rapid growth lies in the fact that during the period when the great progress took place, the period anterior to 1881, there was no great competitive industry in England which tended to retard the supply of human labour for the cotton mills.

Favourable circumstances of climate, power supplies and import of raw material added to the favouring fact that a market for the manufactured produce lay open in the British Dominions in the East, would have availed little had there not been the correlative change in the conditions of English agriculture. For half a century, until 1851, factories and farms both progressed, there was little competition for labour, as the farms lost some of their workers the farmers made up for the deficiency by improved methods which made them more independent of the farm labourer. From 1851 to 1881 the factory began to dominate the situation. The farm labourers and their children migrated to the factories and their attendant collieries, and the farmers failed to keep their workers because they were unable to offer them such good wages, although the prices of farm produce were high and the farmers themselves were prosperous. The farming industry was doomed from that date, and why? Because from that time facilities of communication had so improved that food supplies for the United Kingdom could be obtained from other countries so cheaply, and at an increasing cheapness, that the necessity for England to feed herself had disappeared. Geographically, parts of England lie within the area of the wheat belt of Western Europe; in so far as nature governs human endeavour, England could do a great deal more towards growing her own food supplies than she does, but equally geographically England is suited to the rise of a great factory industry and in the competition the factory has won at the expense of the farm. Roughly, there are four workers at industries to one worker on the land, and in a sense this ratio measures the greatness of the human factor as the predominant factor in the development of south-east Lancashire. Only a quantitative investigation can make such geographical circumstances clear, and only a quantitative investigation can show that the English farmer tills each acre of ground which he has under cultivation to greater profit than any other farmer anywhere else in the world. In regard to the quantity of produce obtained per acre of ground cultivated and per unit of human labour employed in that cultivation, no country can show results which at all approach the result obtained in the United Kingdom. The decline, if such it be, of British agriculture is purely a decline in quantity not a decline in quality, and the net result points out the future of British farming, i.e. the British farmer must develop along similar lines to retain his superiority, he must become the seedsman and the breeder of prize stock for the world. Geographically, his small area and his surrounding army of industrial workers condemn him to develop along some such path. He cannot dominate the food market of the United Kingdom, although he can dominate the market in regard to the sale of textiles of wool and cotton; geographical conditions are against him, therefore the British farmer will find his best success by taking the line of least resistance and continuing the progress which he has all unconsciously made. All these circumstances are the result of a quantitative geographical investigation, and they are set out here for a double purpose, to show first the high aim of true geographical investigation—the statement of the conditions under which human labour here and elsewhere in the world finds its best results, and to show, secondly, that without quantitative work the results of geographical study are largely empirical and not in keeping with the high aim at which the modern teacher of geography should direct his efforts.

Geographical studies, like all other school studies, should have some relation to the conduct of the pupil when he has grown to maturer years, and the quantitative attitude of mind, as well as the scientific attitude of measurement, lies at the basis of right thinking and therefore at the basis of right action.

The method of differences. Before leaving this chapter on quantitative work it will be well to point out a method of demonstrating geographical facts, which has, up to the present, only begun to find its way into school practice. This method involves two processes, (i) the determination of averages which are regarded as norms or constants, and (ii) the determination for individual areas of their particular variations from these normal values. References have been made in previous pages to isanomalous lines and pluviometric co-efficients which are determined by this method, and it may be useful to specify the ways in which this method is of value in school work in connection with the determination of climatic regions.

Temperatures are higher as we approach the equator. This generalisation is usually impressed upon the child from a consideration of annual isotherms for the world, and the child is then introduced to exceptions, such as winter temperatures in Britain and France, which appear to invalidate the general truth of the statement.

If, however, the average temperatures along certain parallels of latitude be calculated, results are obtained, such as those in Fig. 7, to show that on the average, month by month, a place nearer the equator is warmer than one farther away, *provided both places lie outside the tropics.*

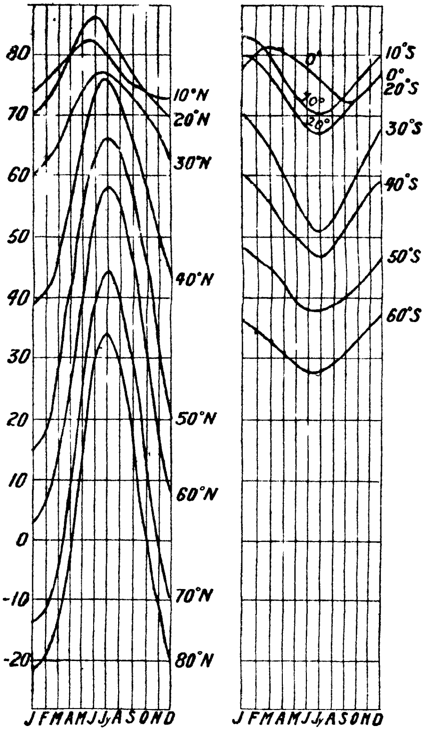

Fig. 7. Normal temperatures for the latitudes shown

Temperature regions. When we calculate the differences for various places from the norms shown in Fig. 7 and map these values, we obtain isanomalous lines, and from these lines we can determine at once the main features of the temperature regions of the world.

I. **Main areas**[1]. (*a*) The tropical belt between 25° S. and 25° N. with temperatures dependent upon the elevation of the sun.

(*b*) The northern belt, north of 25° N., with temperatures steadily increasing in range between January and July.

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[1] *The Scottish Geographical Magazine*, July, 1914.

(*c*) The southern belt, south of 25° S., with temperatures of much smaller range than prevails in corresponding latitudes in the northern areas.

II. **Divisions of the northern belt.** (*a*) A region of abnormally warm winters and slightly cool summers including the Northern Pacific Ocean and the shorelands west of the Rocky Mountains.

(*b*) A region of abnormally cold winters and slightly cold summers centred upon James Bay and extending from the Rocky Mountains to the eastern coast lands of North America.

(*c*) A similar region to (*a*) including Scandinavia, Germany, France and the British Isles

(*d*) A region similar to (*b*) with a centre to the north-east of Korea and including Japan and northern China.

Rainfall norms. Rainfall norms are usually available in school atlases in the form of annual isohyets ; these may be turned into monthly norms by calculating the amount of rainfall per place per month on the assumption that the annual rainfall is evenly distributed throughout the year.

Rainfall differences. Differences from these norms are determined as pluviometric coefficients which express the actual monthly rainfall as a percentage of the monthly normal rainfall as determined above. Pluviometric coefficients may vary from 0 to 500. When the pluviometric coefficients are mapped, the lines so obtained may be called equipluves.

Rainfall regions. Twelve monthly equipluve maps of Africa demonstrate at once the rainfall regions of that continent and indicate immediately how "rainfall swings with the sun."

The winter rains of the north and south are visible at a glance and a new meaning attaches to the area of equatorial "constant" rains. It is evident that even the desert regions have rainy, i.e. comparatively rainy, seasons and that rainfall factors do not suddenly cease to be operative at the annual isohyet of 10 inches. Thus the whole of the rainfall of the continent falls into perspective and the determinant factors can be demonstrated.

Similarly monthly equipluve maps for the eastern United States show how the rainfall is largely a matter of temperature and demonstrate the contrast with Britain where the maps indicate that the temperature factor ceases to be of primary importance.

Rainfall and elevation. The norms suffice to show that high land is wetter than neighbouring lowlands, but the monthly equipluves indicate that the elevation factor acts differently in different areas in different seasons.

Rainfall and temperature. Equipluve maps indicate that the great rainfall regions—monsoon, winter and summer (savannah) rains—are limited to the same area as the tropical temperatures (*a*, p. 115) and that different rainfall features prevail in the areas of latitudes higher than 30°. These areas are usually lumped together as the areas of variable rainfall with prevalent westerly winds ; but the dominant rainfall factor in one part of these areas is quite different from that in another, so that the method of differences must be used to indicate the areas, such as eastern America, where temperature is the main factor. and those areas where other factors operate to a greater degree.

Importance in teaching. The value of the method of differences as a quantitative scientific method of investigation is no greater than its value as a method of demonstration. Practical experience shows that pupils can classify and generalise easily when their attention is directed to one set of facts at a time, and hence the simplicity of isanomalous lines and equipluves is a definite reason why such map lines should be investigated by pupils in school. This value is not generally recognised and hence the matter has been dealt with at some length.

CHAPTER XI

HISTORY AND GEOGRAPHY

The essential contrast. There is an essential contrast between history and geography. The one deals with the growth of institutions and states and has reference to the life and work of individuals of special excellence or of special importance : the other deals with the growths of units within the state, and tends to show that similar units in different states arise under similar conditions. In both cases there occur elements of time and of space, but the intensity of the relative emphasis on these elements is necessarily different. The historical story is predominantly the development in time of political systems which are controlled to some degree by the environment of the world as known at any particular epoch : from one point of view, no period in historical time is of greater relative importance than any other period : geography is interested in the spatial development of the known world now and is interested in the chronological sequence only when that sequence is necessary to the complete and full explanation of geographical conditions It does not deal with the life and work of the men of special ability and intellect, but rather with the work of the average man under average conditions. From the geographical point of view, the predominant period in time is the last decade and for most geographical purposes it is not usually a matter of importance to go back to an earlier period than that which has elapsed since 1880, which year may be regarded as the dividing year between the period of the complete outworking of the Industrial Revolution and the period to which the title Commercial Revolution may justly be applied. The essential difference between the two habits of mind, historical and geographical, is a modern product ; it is due to the very fact that commerce tends to break down the political barriers which form the lines of demarcation in historical inquiries. Geography has been defined as the study of the life and work of man in general in response to organic and inorganic controls, and only in an extremely broad way can it be urged that the controls which cause differences from a geographical point of view cause differences from the point of view of history ; for example, the main story of history is concerned with the growth of modern Europe, but the main story of geography is concerned with the present state of development of the world as a unit.

There are, no doubt, elements in which historical and geographical studies overlap, but the probability is that geographical knowledge is of greater importance to the historian than is historical knowledge to the geographer: for in most cases the chronological information which the geographer needs is not of sufficient age to be rightly placed in historical perspective.

Correlation. It follows from these considerations that there is not much room for correlation in the teaching of history and geography in schools, and that it is chiefly the business of the teacher of history to make use of geographical knowledge where necessary rather than to call upon the geographer to depart from the more strictly geographical method of teaching and adopt a method which runs parallel with the historical teaching of the school: in the long run, New Zealand is geographically more important than Greece, and the Argentine than the semi-desert of Palestine, or the arid plateaux of Spain.

The difference between the outlook of the two classes of student is obvious when one comes to consider the attitude of each towards political boundaries. The geographer finds in the course of his studies that direct governmental control and interference is on some occasions a factor of sufficient importance to be regarded in stating the explanation of a few geographical phenomena, but these occasions are comparatively rare, government is, as a rule, so stable that geographical progress suffers little hindrance from political activities, in fact, it is almost certain that geographical conditions as such, and not historical growth *per se*, are the dominating factors in political controversies at the present time. The practical benefits of a legislative change in connection with the system of land tenure in this country will depend almost entirely upon the closeness with which the legislative measures take advantage of the ways in which geographical changes are occurring all over the world. The question of importance at the present moment is not the historical development of the ownership of land, not the study of the ways in which enclosures have been made, not even the story of the exploitation of the nation as a whole by the landowners when they charged exorbitant prices in connection with the acquisition of land by the early railway constructors: these matters are of little value towards the solution of a modern problem, still less is the story of the migrations of the crofters from their inadequate land holdings. The fact that these are the matters to which reference is made is a sign of the predominance which historical methods of inquiry have gained upon the minds of the political leaders of the country.

The real crux of the whole question is entirely geographical and related to the conditions which have prevailed within the last thirty years. The inquiry should be directed to the present holders of the land, to discover what return they obtain for their labours, and to the actual facts regarding rural depopulation and regarding the present international position of the British Isles with regard to the world production of food-stuffs. The geographical outlook would lay emphasis on the following facts: (i) that Britain does not feed her population; (ii) that the British farmer in relation to the labour which he employs is the best farmer in the world, since per unit of land and per unit of labour he obtains a greater return per acre of ground cultivated than any other farmer elsewhere; (iii) the British farmer is therefore the best example of a successful farmer on an intensive scale;

(iv) the acreage of land farmed in the United Kingdom has decreased because of two factors in two different chronological epochs ; between 1851 and 1881, when the farmer in Britain was obtaining high prices for his produce, the superior attraction of factory and mine caused the labourers to press towards the factory districts, so that he had not sufficient labour to till his ground in the way he knew despite the fact that at the same time many new inventions of both farm machinery and farm processes were gradually adopted; since 1881 much land has gone out of cultivation, because, under the conditions of competition with prairie farming all over the new countries of the world, aided by the stupendous developments in communication, some of the land which had been farmed began to pay too badly to be farmed under the plough. The decline in farm acreage therefore occurred, first, because the labourers left the land, and, at the later time, the decline in acreage caused the labourers to leave the land ; (v) since 1881 millions of workers in other parts of the world have been able to obtain farm produce more cheaply than the British farmer and so have steadily continued to send supplies of food-stuffs to the British market in exchange for the manufactured goods in the production of which Britons have more and more specialised. Consequently, any legislative attempt to increase the production of food-stuffs in the British Isles solely by legislative enactment will run counter to the geographical progress of the world as a whole, and the British Isles in this matter are of such relatively small importance that such attempts would necessarily have disastrous results. This illustration makes clear the distinction between the geographical and historical point of view.

Practical considerations. In addition, however, to these more or less theoretical considerations, there are practical difficulties in the way of any attempt to teach geography from a historical basis. The greatest of these lies in the geographical attitude with regard to the world: historical treatment in schools cannot pretend to a conception of the world as a unit in the same sense in which the unity of the world is to be regarded as essential geographically. The second most important difficulty lies in the divisions of the world and their order of treatment: from the beginning in the descriptive stage the world is divided geographically into world regions dependent upon climatic and vegetative controls: the personal element which is necessary to stimulate the interest of young children is derived from the stories of explorers not from the accounts of the movements of peoples; and while it may be well to describe life, say, in Africa, by means of the stories of the life work of missionaries and others, it is necessary geographically to give as much value to the story of tropical Africa as it is to give to the story of the Mediterranean coast lands. Geographical emphasis differs from that of history.

A third difficulty arises in connection with the work in the transition stage. The nomenclature and the conventions of geography are decidedly very far removed from those of history, and although the historical element may be strained to introduce the conventional network of lines of latitude, etc. by means of an account of the early efforts at determining these lines, there can be little historical significance attached to contours or to isotherms.

Finally, in the argumentative stage, it may be suggested that geography and history run together in the elucidation of certain problems, and in the exposition of their results. An example will perhaps make this matter more definite. Take the critical area of the Hudson-Mohawk traffic line. There can be no doubt that in the history of the American colonies in the 18th century this depression was of profound importance, in fact, its importance is almost incalculable for the historian Any attempt to grasp the story of these early years without a thorough grasp of the relief of the land results in a faulty conception of the historical conditions · consequently, the historian needs the aid of geography ; and in this instance the geographical information is relatively so simple as to be extremely useful in the teaching of young pupils. But the importance of this depression in regard to the geographical description of the United States lies in the fact that nowadays it is useful for communications to a place which has a definite world position. Historically, the depression made the United States : geographically, the depression is important because New York is at one end right on the coast and ready for world-wide sea trade. Every advance made by the United States reduces the relative importance of the Hudson gap, but no change can occur in its historical significance.

Similarly, with the Alps : historically, the Alps dominate the story of Central and Western Europe. In school geography the Alps have little more importance than the Pyrenees, or the Caucasus, or the

Himalayas. A great drawback to the attempt to teach geography from a historical point of view also occurs from the fact that historically there is so little to emphasise in reference to the position in the modern world of India, the United States, Japan, Australia. Viewed in relation to the history of Europe these countries appear dimly on the margin of affairs, viewed geographically these places show more prominently than many parts of Europe.

Summary. It may be well to summarise the position taken up in this chapter. Geographical knowledge is based upon its own definite perspective, it is based upon facts which have a definite concrete reality at the present time. The historical perspective is of a different kind, and depends more upon ideas and opinions—the ideas and opinions of the best historians; witness the change which has recently come over the teaching of history in reference to the inclusion of economic history in the school studies. The concreteness of geography as opposed to the abstractions of history causes progress in the two studies to run along different lines at different speeds and makes it possible for the geographer to prepare for the historian, rather than the historian to prepare for the geographer. The type of mind to which historical studies make their closest appeal is necessarily more mature than in the case of geography, and consequently historical studies belong to later years than those of geography.

From this point of view it may be advisable in certain schools that, instead of dropping geography from the curriculum during the later years, a course which is in no wise to be recommended, although it is sometimes followed, a combined course of study should be followed in which the historical story is laid out upon its true geographical basis. Such studies would take the place, therefore, of the argumentative stage of geographical teaching which has been outlined in previous pages and its development rather depends upon the teacher of history than upon the teacher of geography: for, in such a case, the historical story is of the greater importance and the history teacher should be a geographer first and a historian afterwards. A scheme for such studies should find its place in the companion book of this series upon historical teaching. Such a development of the teaching of history and geography in combination should, however, not come into operation until after the matriculation stage has been reached. Geographical insight and outlook are so important to the cultured mind that the absolute minimum of geographical study should carry the pupil to a complete, thorough, systematic geographical survey of the whole world.

CHAPTER XII

PRACTICAL EXERCISES AND INDIVIDUAL WORK

Practical exercises. The term "practical" as applied to geographical work in schools has not yet crystallised into a definite technical meaning. By practical exercises some writers imply exercises in which the pupil is called upon to deal with more or less "practical" material, i.e. with material which has a direct bearing upon human activities in the world at large. Other writers use the word "practical" in the same sense in which the word is used in the term practical chemistry: and such writers have in mind pupils working individually at definite pieces of work which need not be the same for all the members of a class so that pupils who work and think rapidly are able to advance in their studies at a more rapid rate than their slower class-mates.

Still, other writers maintain that the term "practical" should refer exclusively to work out of doors, such as elementary surveying, field work and geographical excursions.

There is one point of importance in regard to the first conception of the meaning of the term "practical"; all geographical work in schools should as far as possible be of such a nature. Theorising should be left to the latest stages of school work and to studies at the University. Practical exercises, which call for individual work by the pupils, find a fitting place in the transition stage of teaching. Since the pupil must become familiar with the conventions and the shorthand of the subject, it is obvious that his familiarity will increase in proportion to his practice in the use of the conventions and the shorthand. Each new convention, each new method of representation of geographical fact, should be presented to the pupil, therefore, as a definite method of attacking a definite problem.

The pupil, for example, should begin by making contour lines, isotherms, etc. before he uses such lines in a piece of geographical inquiry. As a matter of practical experience, even the more advanced pupils require such a groundwork, when they meet a new convention, even when they have had similar practice with similar conventions: consider the case of isanomalous lines. These lines present the facts with regard to those regions of the world which are specially hot or specially cold, during certain months, with definiteness and precision: they form a useful supplement to the consideration of isotherms, and they supply a means of checking the accuracy of the deductions which pupils make from temperature maps. The winter warmth of the British area is a fact of prime importance, and consequently, in practice, such deductions from isotherms and such checks by means of isanomalous lines fall naturally into place during the consideration of this phenomenon. Pupils who have been familiar with isotherms, etc. for at least two years find a difficulty in appreciating the exact value of the new convention, and therefore they require practice in the construction of a map showing abnormal temperatures.

The exercise may be set in the following fashion:

> On a world map showing January isotherms, record the temperatures of the isotherms which cut parallel of latitude 60° N. Find the average of these numbers and call this average the average January temperature along latitude 60° N. Trace a map of the North Atlantic Ocean on a fairly large scale, insert parallel 60° N., and mark on this parallel the spots where it is cut by the isotherms: record against each spot its temperature above or below the average temperature for the latitude. Proceed similarly for parallels 55° N., 50° N., 45° N., 40° N., 65° N., 70° N. Draw on the traced maps lines joining all the points which are recorded or are estimated

to have temperatures 10°, 20° and 30° above the average. These temperatures are called anomalous temperatures and the lines are called isanomalous lines. What do you infer about the temperature of the atmosphere over the British Seas in January ? What do you infer about the presence of abnormally cold regions in northern latitudes in January ? Where would you expect to find such regions ?

The aim of practical exercises. The dual aim of a practical exercise will be clear from the preceding illustration : it may be stated broadly thus :

(i) to enable the pupil to understand a convention,
(ii) to cause the pupil to learn a fact.

In the transition stage, the first aim is of chief importance, but the graduated course of exercises through which the pupil works brings him step by step to the right attitude, the convention is not an end in itself but a means to an end, so that towards the close of the transition stage the pupil is at work on exercises in which the main feature consists of the acquisition of facts in relation with other facts. The early exercises will bring into prominence the convention, e.g. the pupil may be expected to colour a map printed with outline and contours only. He may then describe the relief of the land in broad outline, and may answer definite questions so framed that they provide a reason for the particular layer system of colouring which he has used. He will colour other maps, and so on, until he has so absorbed the notion of surface shape from the convention that he is ready in the interpretation of coloured orographical maps either on the wall or in his atlas. So soon as he has acquired this facility, he will cease to colour maps to show relief unless he desires to use colours to illustrate a particular point in a geographical argument. The colouring of maps is not an end in itself.

Map-making by the pupils. The subject of the maps made by the pupils may be treated under two distinct heads .

(*a*) working maps,

(*b*) sketch maps in illustration of a geographical description or of an answer to a question in a geographical examination.

Working maps are maps made by the pupil in the course of his studies, and since the value of the pupil's investigations usually depends upon the accuracy with which such maps are drawn, it follows that all such maps should be accurately and carefully constructed. Hence, as a general rule, the pupil traces his working maps from his atlas. During the later periods of the transition stage the pupil should be required to construct accurate maps on drawing paper and he should be shown how to secure accuracy. For this purpose the network of parallels and meridians is essential ; for the pupil should never draw a complete coast line (or a complete contour or isotherm) until he has marked the points at which such a line crosses the parallels and meridians. A map drawn by the pupil is not to be considered as a freehand exercise, since the best and the worst pupils in drawing must produce reasonably accurate maps ; the work must therefore be mechanical. The pupil may be encouraged to memorise a network and the points where the coast line cuts the network of such an important area as the British Isles. Having had much practice in tracing and drawing maps, it is reasonable to expect the pupil to draw a map as a memory exercise and therefore the pupil should be constrained to form the habit of illustrating answers to test and examination questions by memory sketch maps. Such memory maps belong to the second class of pupil's maps and their accuracy and value will depend upon the pupil's

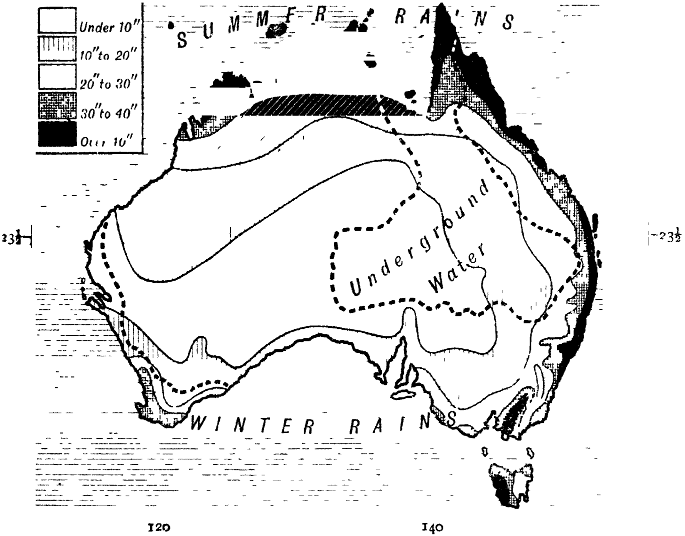

Fig 8 An illustrative Sketch Map.

skill in drawing and upon his practice during his periods of practical work in making his own maps. If the co-operation of the art master can be obtained it will be a valuable exercise if the pupils make flat contour maps from a bold relief model as one of their exercises in drawing. The value of memory sketch maps lies chiefly in their utility as illustrations and provided the pupil betrays some feeling for geographical relationships in such a map his work will be extremely useful.

Excessive attention to map-making by the pupils is to be deprecated. A steady persistence on the part of the teacher in compelling continuous improvement, in both kinds of pupil's maps, will be rewarded in time by the production in work books and on examination papers of really creditable maps: pupils acquire this power very slowly, some pupils even fail to acquire such ability until very near to the close of their school life.

Individual progress. Practical exercises attempt, therefore, to provide the pupil with opportunities for the display of his individual powers, and they aim at causing the child to think for himself. The pupil's powers of thought are, at best, weak, and such exercises, therefore, at the early stages demand but little from the child in the way of statement of results achieved. He may be called upon to describe what he has done, but the statement of what he has found out will, at first, be very short. The teacher must always be prepared to drive the pupil forwards so that, as his powers increase, his statements of results increase in length and complexity. In this way the pupil will gradually lose his interest in the convention *qua* convention and acquire an interest in the results he attains for himself. Only by persistent effort on the part of the teacher can the dangers of too great a devotion to heuristic methods be avoided.

Such exercises, therefore, towards the end of the transition stage resolve themselves into the study of all the available conventions which convey information about a new country, in order that the pupil may write in broad outline a description of the geography of a country or of a region which is new to him.

Deductions. Practical exercises provide, further, opportunities for early practice in making geographical conclusions. The conclusion to be reached should result from a legitimate deduction, and should be capable of precise and brief statement. One of the best exercises of this type lies in the establishment, by the child, of Buys Ballot's law regarding wind directions. The pupil draws on the same map, wind arrows and isobars, and he is asked to infer the connection between the two conventions.

Other similar exercises occur when he places a traced map showing the relief of Britain under a traced map showing British rainfall, or the distribution of sheep rearing in Britain; or when two maps, (i) showing distribution of population and (ii) distribution of sheep in New Zealand, are compared.

So soon as the physical facts regarding condensation have been learnt, the pupil may work a set of exercises to determine the following relationships: (i) elevated air is cooler than air at sea-level; (ii) in July the air over the sea off the coast of Sind is about the same temperature as the air over the Indus lowland and as the sea-water itself; therefore, on-shore winds will not drop rain on the Indus lowland; (iii) therefore on-shore winds will drop their moisture only when they are forced to rise by the highlands to the north of the Panjab, etc.; (iv) so, Rajputana is desert, the Southern Panjab is semi-desert.

Geographical conventions the basis of geography. In connection with these practical exercises it may happen that the pupil is called upon to use a convention before he understands the scientific explanation of the causes to which the conditions conventionally represented are due. For example, is the pupil to use isobars before he has reached the stage in his science course at which the theory of the barometer is explained? The answer to such a question is: "Certainly, provided the convention (isobars) is related to something which he can understand." The isobar should be related to an instrument, the barometer; which many people observe and use without knowing why the height of the barometer varies. The "height" of the barometer alters, and the alteration implies certain probabilities; the knowledge of these results, as facts, is independent of the knowledge of why these facts are connected with the moving mercury in the instrument. Consequently, since inferences can be drawn accurately without this theoretical knowledge, the pupil may be called upon to use the conventional isobar and to make such inferences, e.g. Buys Ballot's law, as are suitable to his powers.

Organisation by the teacher. Individual work by the pupils demands greater organisation on the part of the teacher, but apart from the fact that such work is beneficial in itself, such work has the advantage of providing the teacher with opportunities for securing the performance of many exercises which he would find beyond the powers of the class were he to confine himself to class instruction and oral or written work, by all pupils at the same time.

Many pupils are more rapid workers than others, and consequently the teacher will find that he can employ these children to do work which otherwise would fall to his lot. Many of the maps which he requires for purposes of class discussion when he takes the class as a whole at definite intervals in order to bring the work of the pupils to a definite focus, all the models which are required for the work of the various classes, some of the lantern slides which he requires for illustrative purposes, can be made for him: so that, in the long run, it is probable that the teacher who develops a course of practical exercises has less work to do than the teacher who teaches dogmatically in class.

Practice in method. Finally, practical exercises tend to give the pupil good habits of thinking and writing. In the first place, he has thought for himself; secondly, he has gradually improved his powers of geographical expression by means of words; and thirdly, he is so accustomed to the use of the shorthand of geography that it becomes almost second nature to him to illustrate a written statement by means of map or diagram.

At the same time, the pupil has been trained in attention to detail and in accuracy of thought and expression, so that he is on the whole less likely to make stupid blunders in the examination room. Further, he has had experience in reference to the facts which lie behind the conventional signs which he finds in his atlas, he has had experience in the interpretation of atlas maps, and is familiar with the difficulty of stating in words the precise information which a map conveys at a glance to the trained eye, and therefore he is prepared to place a more just interpretation upon statements which he finds in books or newspapers regarding geographical matters: he has attained some powers of judgment, and some sense of perspective.

CHAPTER XIII

THE USE OF THE GLOBE

The indispensable globe. A globe is indispensable, especially for the beginner in geography, and throughout three quarters of his school life the secondary school pupil is little more than a beginner. The pupil's first introduction to a globe as a model of the earth occurs at the time when he is ready to absorb notions of all kinds from models. He has his toy engine, his miniature warship; she has her diminutive baby model, or her model house. Consequently, during the period when instruction usually takes the form of stories, the answer to the child's question, where is this country, can be given in reference to the globe.

Names such as Livingstone's country can be written on a black and white globe, or little pennons containing the name can be erected on a globe of a different kind. The pennon can be moved as the narrative of Livingstone's life and work is continued, or a few lines may be drawn upon the other globe as a record and reminder of each lesson.

Throughout the descriptive stage the globe should be ready for use, if not actually used. No teacher of experience can foresee the day when a chance question from a pupil will not reveal an ignorance or a misapprehension in the minds of his children to which it is well, to attend at once. The lesson planned for that day is discarded, and a new lesson is taken to suit the needs of the moment, therefore the globe should be available.

The network of meridians, etc. Early work on maps involves a steady reference to the coast lines shown on the black and white globe, and the moment the conventional network of meridians and parallels is reached the globe becomes all important.

In regard to this network the primary difficulty of the teacher lies in his decision as to how far he is prepared to dwell upon the mathematical conception that two measurements from a given starting point are requisite to determine position. He should be guided by the particular class before him. Some children will lead him on by their readiness and aptitude, where others will fail to grasp the notion that the two measurements have any significance at all. Some classes are ripe for an introduction to this principle, others are not: but he need be under no qualms about leaving the matter for the moment. The pupils will appreciate the principle sooner or later; either in lessons on geography, or mathematics, or physical science, the significance of our daily practice in such matters will penetrate into their consciousness and for him to labour the point at an early stage is a waste of effort. Such matters of everyday occurrence and importance can safely be left. But, although the grasp of the principles underlying such a network may be delayed, there is no reason why the pupils should not be introduced to the network as a fact, as something which men are in the habit of using, something to which sailors must pay attention in order to save themselves from possible shipwreck.

Consequently, the early lessons should emphasise the fact that the lines are drawn on globes and maps, but not drawn on the actual earth, because such lines so-drawn are useful to men. Some pupil will probably ask at this stage why we do not mark such lines on the earth itself: the question may not arise quite in this form, but some question of the kind will suggest that the pupils are ready for a lesson on the relation between the network and the sun's altitude, etc.

The earth and the sun. Either in the course on Nature Study or in Geography the pupils will have made observations that the sun moves in the sky, and that the sun is higher in summer than in winter[1].

> Set up the lantern and the globe full in the rays of light with a sharp shadow on the screen behind the globe. Experiment with pins to let the children observe the facts: (i) when pins point to the centre of the globe, shadows point towards the pole; (ii) shadows point directly to the pole only when the pin is, as it were, on the middle line of the illuminated portion of the globe; (iii) as the globe rotates the shadow slightly alters its direction from one side of the pole to the other; (iv) the shadow is shortest when it points polewards directly; (v) pins on the same meridian have their smallest shadows at the same moment;

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[1] It is a matter of no consequence at all at this stage that the sun's motion is apparent: if the pupils can appreciate the difference between real and apparent motion lead them to the conception, if not, concentrate attention on the observable facts.

(vi) pins on the same parallel have a constant value for their shortest shadows; (vii) when the north pole is illuminated best, the feet of all pins lying within the Arctic circle are constantly illuminated while the globe rotates, and conversely; (viii) when the globe is rotating the top of a pin is illuminated before its foot.

These and other facts may be observed by the children, and these observations may take one or more lessons as the children show greater or less keenness in the exercise.

The related exercise in imagination will arise when the teacher asks the class to imagine that the lantern represents the sun and the globe the earth: the agreement between the observed facts regarding shadows of a pole in the playground and the pin shadows follows naturally and leads to the suggestion that a daily rotation of the earth explains the circumstance of day and night. Tourists in Switzerland notice the morning light from the rising sun first on the mountain tops, etc. Such an agreement justifies the child in a further stretch of the imagination under the guidance of the teacher, so that the difference between the tilt of the earth towards or away from the sun becomes the explanation of the difference between winter and summer, between midnight sun and perpetual darkness during many days.

The meaning of midday, the explanation of meridians as time-lines, and of parallels as lines of equal sun altitude on each day of the year, the tropics as lines of vertical sunshine once a year, the intertropical spaces as areas of two days of vertical sunshine annually, and similar facts follow as the class enters into the spirit of the imaginative exercise. Finally, the typical exercises on the relation between longitude and time are worked out, and it is a matter for surprise to those who have not tried the experiment how young children can in this way work out such problems with speed and certainty.

Shape. Finally, in the descriptive stage, the globe is necessary in regard to the shape of the continental land masses, and each lesson on a continent should be given in relation to the globe, and rivers, etc. marked (*a*) on the black and white globe, and (*b*) at the same time on a sketch picture (map) on the flat blackboard.

The world background. In the transition stage, world ideas require a globe setting. So soon as the class reaches world notions of climate and vegetation regions, the summary of the main broad generalisations relative to wind movements and their relation to solar heat, as well as their consequences in rainfall and vegetation—then the globe is required. Side by side with the blackboard sketch the black and white globe is marked with coloured chalks in close agreement. The blackboard sketch summarises the observations of the thousands of observers whose work lies behind the isohyets and vegetation conventions of the atlas, the transference from the flat sketch to the globe model is intended to lead to the recognition of the principle that climatic and vegetation regions are dependent upon what has been termed "the swing of the sun," and what really is "the tilt of the earth."

Globe measurements. During this stage, globe measurements should accompany map measurements in regard to the measurement of the map network to determine the scale on which the map is drawn, and at the same time the pupils may be introduced to the notions underlying great circle sailing. For this purpose a piece of cardboard with a semicircle cut out of it, and with the curved edge marked in degrees after the fashion of a curved protractor provides the requisite apparatus. When the pupils have realised that the shortest distance between two places is along a great circle, then they can be set to discover from a suitably marked globe the relation which exists between the main steamship routes and great circles.

World realities imagined. In the third stage it is well to remember that no geographical problem is adequately solved unless the world setting of the data is considered, so that the globe falls naturally into place even at this stage. The investigation of the climatic conditions of the north-east Atlantic shorelands becomes much easier when the flat map is associated with the globe. Pictured on the globe, the swirl of the winds round the Icelandic low-pressure, the resultant accumulation on the shores of Norway of heat from the sea and from the winds, the relative position of the North Cape and Cape Farewell, achieve a reality which they cannot attain on the flat map. The storm tracks of the Atlantic Ocean are seen in true relation with the great wind system of the world as a whole.

Only in reference to a globe can the pupils realise the explanation of the easterly element in the trade winds or the anti-clockwise whirl of the air round a cyclonic depression.

CHAPTER XIV

CONTOUR LINES

Contours a convention. The special treatment of contour lines belongs almost entirely to the transition stage, and the work is divisible into three portions: (i) the appreciation of the methods by which contours are obtained; (ii) the appreciation of the facts which contours summarise; and (iii) the broad grasp of the relief of an area from its contoured presentation.

Mountain, upland and lowland. An introduction to contour lines may arise in the descriptive stage in regard to the broad distinction between mountain, upland and lowland. Rivers are no less an important concrete fact than coast lines and consequently river maps are the earliest form of maps of inland districts. Now the observable facts about rivers and streams lead to various inferences from river maps regarding water-partings and intervening ridges, as well as regarding drainage slopes, and it is therefore possible to show such river maps to a class and to determine from them facts regarding the relief of the land. But the river map is not conclusive as regards the configuration of the country, as it does not supply sufficient data to determine whether a slope is steep or gentle, or whether a river rises among mountains, or only on a slightly elevated undulating plateau. Consequently, a first attempt is made to indicate the presence of mountains and the class may be shown the early conventions used for this purpose. These are the pictorial representation of a series of isolated peaks, the herring bone method of showing a continuous chain, the early forms of hachuring to show slopes, etc. Then the class may be introduced to the layer system and to the typical height lines, which are map lines not real lines on the country side.

Outdoor work on contours. In the transition stage attention is first paid to the determination of contour lines and this is largely outdoor work. The class is taken to a convenient place and either the pupils or a series of poles are arranged so that their feet are at the same level. The levelling may be approximate, as occurs when the work is dependent upon sighting along a horizontal line determined by means of a spirit level, or it may be made increasingly accurate by the use of a water level (which may be home-made) or a plane table or a theodolite. Preferably the work should be done with home-made apparatus and reference be made to the more delicate instruments of the trained surveyor. But the essential fact is that a series of points may be determined at the same level. When these points have been determined it is no more difficult to make a map to show them than it is to make a map of a river, and the line drawn on the map connecting these points is of the same type as the line drawn on a map to depict the bank of a stream.

Indoor work on contours. An indoor method of arriving at the appreciation of contours occurs in connection with sand in sand trays or with trays of modelling clay or plasticine. Here the pupils make a model of a sloping piece of country and determine points of equal height above a given base level. Points at several levels are determined and a sketch map of the lines joining such points is made.

Types of contours. The second step in the treatment of contours is the most difficult. Any fairly simple model showing valleys and ridges will serve at the beginning. The model is sketched and the rivers are drawn, then the pupils insert the directions of typical contours and so determine the fact that V's or U's on contours (i) pointing up-stream indicate a valley, and (ii) pointing down-stream indicate a ridge. From this fact it is a comparatively easy step to the recognition of a hill-top in the shut-in ovals of a contoured map.

These points of general importance are, perhaps, best taken with the class as a whole, but the later steps which involve the individual appreciation of the details of contoured maps are best taken individually.

Model making. For this purpose, each pupil during his school career should assist in the construction of a relief model from a contoured map.

It is decided that a class in the transition stage, aged about 12½ years on the average, shall make a model of that portion of North Wales which includes Snowdon to the north and the Rhinog Ridge near Harlech to the south. The area is contained upon portions of two adjacent sheets of the Ordnance Survey, and the portions of each sheet which are required are carefully marked upon the map. Then, in class, the procedure is as follows: one boy traces the coast line from the Snowdon sheet, a second boy traces the 100 feet contour on a second sheet, a third boy the 200 feet line and so on until separate sheets are ready, each with one contour drawn in ink. Then on each sheet a tracing is made in pencil of the line immediately above it. Similarly, a second set of sheets is prepared from the Harlech map. The work in the class-room is now complete.

Thin strips of lath each $\frac{1}{10}''$ thick are now prepared and taken into the modelling room by two boys. These boys prepare a rectangular layer of clay $\frac{1}{10}''$ thick, larger than the area of the chosen portion of the Ordnance Maps. When the layer is ready, they lay both the 100 feet tracings in position on the wet clay and cut out the shape of this contour level. Next the coast line tracings are placed on the wet board on which the clay model is to be built, and through the pencil lines thereon marks are made on the board to show the position of the 100 feet layer in relation to the coast line: when these marks are completed the 100 feet layer is transferred to the board in strips of clay at a time.

Meanwhile, one other boy is preparing the 200 feet layer, which is duly laid in position above the 100 feet layer.

A fourth boy now prepares the 300 feet layer under guidance from the second boy, while the first boy has gone back to ordinary class work.

In this fashion a succession of layers is placed in position by a succession of boys. Above the 1000 feet level the $\frac{1}{10}''$ guides are replaced by $\frac{1}{4}''$ guides, since the contour intervals are now 250 feet.

Finally, a stepped model in clay is ready and the class is taken to see the first substantial result of their work. By agreement with the art master duffers at drawing have worked in clay during the art periods and enthusiastic boys have worked at the clay in their own time.

Now certain of the most capable boys attempt to fill in the slopes with clay. The teacher now gives more frequent guidance and himself demonstrates how some of the most difficult portions of the work should be done. In the end, a clay model of the district, with vertical exaggeration 5 28, is ready.

The class repairs to the modelling room. Six pairs of boys, each without a coat and with bared arms, stand by an ordinary bucket half filled with water.

In the middle lies the clay model surrounded by a wall of clay set about 3″ away from the model itself. The wall is higher by about 4″ than the top of the Snowdon peak. Plaster of Paris is now poured into each bucket, a little at a time, and the boys work with their hands to remove lumps and make a smooth paste, which thickens with each dose of plaster. The teacher feels the consistency of the plaster in each bucket and adds plaster or water until the six buckets contain a mixture which is becoming thick and tends to set.

A signal is given: six lots of plaster are poured over the model and the teacher smooths the fluid over the model, trying to obtain a consistent mixture and to obviate air bubbles. The surface of the plaster is then levelled. Within a quarter of an hour, the plaster is set, the retaining clay walls are removed, the model is separated from the mould which is then left for a day or two to dry.

The surface of the mould, when dry, is covered with a weak coating of enamel paint, which is left to dry: some days later a second coating is added.

A few days later the mould is laid on the floor of the modelling room and a thin coating of oil applied to its surface; the class again assembles, other boys build a retaining wall, still others mix the plaster, which is poured into the mould. Within a short time a plaster model is on view. This model is coated with white enamel paint and is then ready for other boys to add in colour the rivers and lakes, etc.

Fig. 9. A model showing Snowdon, the Vale of Maentwrog, Ffestiniog and Harlech.

Profiles. Meanwhile, certain details as to contour lines can be studied by the construction of profiles or sections. The first section should be made from a model: usually the edges of the model are sufficiently well-cut for this purpose. The contour lines should be drawn and the projection lines made and the final profile developed. Questions of visibility can then be determined, as well as the vertical exaggeration, and they can be tested with a straight edge on the model itself. Then the pupils should make sections from typical contour diagrams. A test may be applied at this stage, by asking the pupils to make typical contour diagrams of a valley showing a pass outwards towards the north-east, with a steep western slope and more gentle slopes elsewhere, etc.; or, a picture may be set up and the pupils asked to sketch a contoured representation of what they see.

Outline contour maps. For the next step, copies of contoured maps of definite important districts should be distributed and the pupils should be required to colour the map on the layer system. Such districts are (i) the neighbourhood of the school, (ii) the Forth and Clyde, the Rhine, and the Hudson valleys. So far as possible, these maps should be related to actual models of the district previously made or in process of construction on a different scale. The teacher will find much that will interest him in the questions which will be addressed to him by individuals who have difficulties in appreciating the meaning of the lines on the map. When the maps have been coloured, the pupils should be asked to describe the relief of the district, under the heads of (*a*) position regarding England, etc.; (*b*) size; (*c*) rivers and valleys; (*d*) ridges and slopes; (*e*) peaks and water-partings. The attempts at a first description of this kind will greatly vary in excellence, and it will probably be found necessary to devote time for a class discussion of the area. A large map of the district should be displayed and the teacher should describe the area for the class; and the pupils may be set to write out the description a second time. In practice, it will be found advisable to follow this exercise by a second exercise of a similar kind on a more difficult map and to require a much better description of the area.

Finally, the pupils may be consistently called upon to provide at the commencement of their study of any particular country an outline description either written or oral of the main features of the relief of the land from an atlas or wall-map.

By this time the pupil will have concluded his study of contours as a method of representing geographical facts, and he can now be introduced to the maps of the Ordnance Survey so as to appreciate the principles of hachuring and the representation of almost perpendicular scarps of coast cliffs.

Sketched contours. At a later stage when individual work becomes more pronounced, and when a pupil is making an investigation of one aspect of a country for the benefit of the whole class, it may be advisable to set one pupil to construct a contoured sketch of an area from somewhat scanty data. For example, the geological reports of New Zealand contain maps on which the rivers are clearly and carefully indicated and certain heights are marked precisely. A pupil might be set the task of completing from these maps and the description of the relief which accompanies the map in the body of the report a contoured sketch of the area investigated by the geological survey.

Panoramic pictures. Closely related with work on contoured maps is the construction of pictorial representations of land forms. Pupils may be shown how to obtain a picture of a district from the contoured map (vide *The School World*, Feb. 1911), and here again the assistance of the art master may be invoked.

Fig. 10 is made from a boy's work in this connection. Such work will be easier if the proposals set out on p. 21 for correlated work at an earlier stage are adopted.

The final aim of such work as this lies in the ability of the pupil to make a drawing which represents the configuration of the district as he imagined it. The most notable work of this kind is to be seen in the published work of W. M. Davis and others, where the diagrams are drawn to appear as if they were photographs of relief models. No illustration of a discussion of the relief of any area can be regarded as adequate unless there be some attempt to indicate three dimensions and illustrations should appeal to the eye as well as to the imagination.

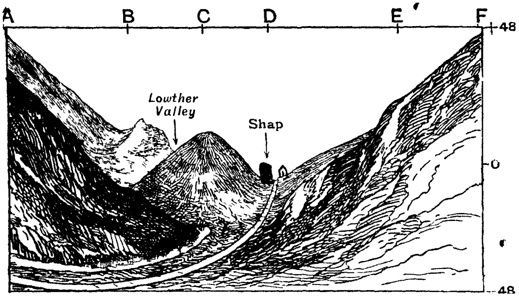

Fig. 10 The Road over Shap Summit (a pupil's drawing from a contour map)

CHAPTER XV

SEEING SOLID

Models. All the methods usually adopted in order to signify the relief of the land, contours, hachures, pictures, etc., pale into comparative unimportance for young pupils in face of the solid model.

During his school course the pupil should receive such a training in visualisation that the relief map, whatever may be the relief convention used thereon, stimulates his mind to attempt automatically to see with the mind's eye the surface represented. Such power of visualisation comes to different pupils at different rates, and with different intensity, but the pupil must be encouraged, whatever his capacity, to try to make the visualisation.

It follows, therefore, that the training in this connection forms an important part of the work of the school not only in geography but in the correlated portion of the course in Art.

The first stage in the work lies in causing the pupils to call into mental vision places which they have seen and places which they know, so as to familiarise them with mental pictures of solid relief.

This work can only be done by means of talks with the class or with the individual pupils about such places.

The second step lies in the attempt to build up by gradual process simple mental visions of simple relief forms, such as those of a single hill, a pass, a valley, etc. This attempt can be made by using models, pictures, photographs, maps, all of which relate to the same piece of real country. The contoured presentation of an area of bold and simple relief should be made at the same time as the model of the district is studied, and at the same time also the pupil should be attempting in his drawing lessons to reproduce certain aspects of the country by means which are detailed in a later chapter. Such work can be undertaken during the descriptive stage, and when the work of visualisation has proceeded so far that these pieces of apparatus have been carefully examined, the process may be stimulated by means of a lantern lesson where photographs of different elements of the area are shown separately, so that the pupils may piece them in with the rest of the mental picture. No doubt at this stage the mental picture is hazy, and inconclusive; but the power of the pupils will increase with later work. During the transition stage, as has been suggested, each pupil should assist in the construction of at least one model; and should have careful practice in colouring by the layer system a detailed contour map of a small region, which he will finally study, when the colouring has been completed in relation to a model. This work is preparatory to the next step which consists in taking piecemeal the contrast between two widely different areas. In practice[1], the Snowdon region and a portion of the south-coast district near Brighton have been found to provide adequate material for these contrasts. Here we begin with the models, which are set up side by side and examined. The shapes of the ridges, the peaks, the valleys, etc. are noted in turn and contrasted;

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[1] *The Geographical Teacher*, Summer, 1914. See also p. 220.

and then the representation of these features on the contour map are noted. When the separate portions of the areas have been examined in this detail, the special features of the models are dealt with in relation to human activities as shown by means of the roads, railways, bridges, villages, farm work, etc., all the time in contrast. Continuing the work the pupils are taken to the study of pictures of the area. Still in opposition the features are shown on the screen, and the view point and range of the camera with reference to each picture is indicated upon the model. In this way an intimate acquaintance with each district is obtained and during the process the pupil is introduced to such technical terms as scarp, right and left bank of a river, etc., just as they naturally occur in the description of the piece of country represented before their eyes.

Such work as this will depend upon the teacher's previous experiences: he will have taken the photographs himself; if possible, he will have travelled over each area, and consequently his choice of districts for this purpose will depend upon his earlier facilities for travel. The next step lies in the study of a district in complete detail in relation to a model. The complete geographical story of the district is worked out by the class from the usual sources, and during the discussion of the class results the model is used as a basis of reference.

Side by side with this work, there will proceed work on maps and photographs of many different parts of the country, so that the pupil is always at this stage faced with two methods of presentation, both of which are intended to convey the impression of solidity.

It is not suggested that these various stages in the process of solid visualisation should be consecutive: there should be various intervals between the times when a definite appeal is made to this capacity for forming mental pictures, so that the pupils may have had time to grow geographically and to add to their personal experience in the world during the periods of rest. Geographical growth will proceed from the other geographical work with which the intervening lessons are occupied, and personal experience will follow upon the holiday travels of the pupils themselves. There is no need, here, to do more than refer to the suggestions in a later chapter for holiday work, and to the suggestions which are made in the same chapter on outdoor work.

The photographs which are shown in the lantern lessons, should also be shown as ordinary photographic prints on the walls of the class-room, so that there is time for the renewed and the detailed examination of the pictures by the pupils.

The stereoscope. If it be possible, some of the photographs if not all of them should also be available in the stereoscope. The class use of the stereoscope should be made somewhat as follows.

> For each lesson about ten scopes and ten prints should be used. The pupils should be arranged in five groups, the better plan is to arrange them in five rows. Each pupil is instructed to record his impressions of each of the pictures which he sees under its appropriate number in the series, so that he is occupied during the whole of the lesson either in looking or in writing. The first pupil in each group is then given a scope; he notes the

number of the picture set therein, and title and the brief summary on the back of the picture; he adjusts the scope until he sees one picture apparently solid. (This requires the teacher's supervision, and the teacher should always talk of the view as if it were really and not apparently there.) He looks at the view until he feels that he knows it, and then he passes the scope to his neighbour, and proceeds to record his impressions. Meanwhile, the middle pupil of each group has been similarly started and so ten pupils are looking at a picture at a time. Pupils who are sitting idle especially at the beginning of the lesson should be examining a map or reading about the district under consideration. When each scope has passed down its row it is transferred to another row, until each pupil has seen the ten pictures. While the examination is in progress the teacher will find much to occupy his attention in noting the kind of impressions which the pupils are recording and in stimulating the observation of the pupils to specific points which they may otherwise overlook. The remarks recorded by the pupils should be read aloud to the class during the next lesson and corrections and additions made to them. Finally, the remarks should, at the option of the teacher, be copied into a permanent record book.

These suggestions about the use of the stereoscope are to some degree ideal, since few teachers have stereoscopic cameras and since the makers of stereoscopic pictures have not yet begun to supply material for such lessons. The value of such a lesson however should not be overlooked especially on the psychological ground, that provided the teacher can maintain an atmosphere in the class-room, wherein there is little or no call upon the pupils to pay attention to their immediate surroundings, the pupils may feel to some degree, that they are actually looking at the country and not at a picture.

The stereoscope is available in other ways for the purpose of "seeing solid." The makers of such pictures can supply sets of pictures which serve to revise lessons on the geography of distant lands. Suppose it be desired to revise work previously done on a definite vegetation region such as the tropical forest, or on a definite country such as France. Ten pictures are selected from the maker's lists, and are used in the same way as the ten pictures suggested for use above.

For certain subjects, there is little necessity for the pupils to see solid, and in such cases an ordinary print from a single lens photograph will suffice; there are also certain cases where the essence of the picture lies in motion, and then the kinema is the suitable apparatus, but for the study of still objects, whether land forms, buildings, plant environments, the stereoscope is the suitable and appropriate pictorial agency.

Block diagrams. Much of the work here suggested falls naturally into place during the transition stage of teaching, and it would not be fitting to close this chapter without some reference to the block or solid methods of illustrating geographical arguments which is gradually finding its way from the text-book and the scientific journal to the teacher's blackboard.

Suffice it to say that unless the pupils have become familiar with models which represent a real piece of country they will fail to appreciate to the full the block diagrams used with increasing frequency to illustrate the discussion of land forms, etc. Block diagrams to show the processes of river capture, for example, are ideal and abstract, and their use should follow some earlier experience of a complete model of a real landscape

Explanation of geographical terms. In teaching the meaning of technical terms relating to relief of the land, the solid illustration is by far the most useful of the apparatus which a teacher may use. Pupils find a difficulty, for example, in realising the meaning of such terms as "water-parting" and "catchment area," and it will be advisable to have the models in such a position that the teacher may, at a moment's notice, turn to the model and use it for demonstration purposes. Pupils are always eager to point out on a model the physical features to which reference is made in class.

Models and geographical associations. The capacity to visualise a mental picture of a solid form is extremely valuable in relation to geographical associations such as (i) elevation and annual rainfall, (ii) the location of trees and plantations in the river ravines of wind-swept regions. Consequently, the pupil should use a model in connection with the coloured edition of the Ordnance Survey map and should examine a model on which annual isohyets have been marked, e.g. the 30 inch isohyet on the Sussex model of the South Downs.

CHAPTER XVI

OUTDOOR AND HOLIDAY WORK

Varieties of outdoor work. Outdoor work is of two kinds, organised class work or organised group work and individual work on separate areas.

Organised work will occur when the teacher takes a class or a group of pupils to study together a certain aspect of geography; individual work arises when a pupil either in response to a suggestion from the teacher or as a result of the interest in matters geographical which has been aroused in him performs a piece of work in relation to some geographical circumstance which arises within his experience either unexpectedly or from design.

Organised class work. Organised outdoor work is done in part at least in school-time, or on half-holidays, individual work usually occurs during the holidays. Organised outdoor work occurs in the following places:

(i) The playground or playing-fields; (ii) neighbouring country within easy reach of the school; (iii) more distant country which can yet be reached within a day; (iv) less frequently, in a distant region which is attained on a school journey; (v) in a museum or place of geographical interest, such as the docks, or the local goods station; (vi) in a visit to an observatory or a lighthouse.

Organised outdoor work varies equally in the purpose for which it is undertaken. The class may be concentrated upon practice in reference to one particular series of observations, for example, when they take an observation for sun altitude in the playground at noon on one of the equinoxes; or observations may be spread over the whole of an area, for example, when in conjunction with work on nature study the pupils set out to record plant associations in a neighbouring forest or wood. The pupils may work out of doors in connection with their first efforts at appreciating the meaning of contour lines, or they may make use of plane tables to plan the school playing-field or to set out the tracks and other appurtenances for the annual sports day, or they may take levels of the field in preparation for work which they will later perform of levelling and laying a cricket pitch. Again, they may travel in company on foot, by train, or by canal, in order to study the complex features of a given district, or they may set out for a neighbouring hilltop to view in panorama the countryside. A visit to the docks may yield concrete illustration of the fact that commodities from the ends of the earth are brought to our shores in British ships, and a visit to a museum may lay bare some aspect of geographical importance, for example, the geological museum or the natural history museum may yield for their inspection some of its treasures. The choice amid so many possibilities will depend upon the teacher and his circumstances, as well as upon his opinion as to whether such expenditure of time and effort is worth while. There can be no doubt that the teacher of geography must compromise between what he would like to do given very favourable circumstances and what he is able to do; like all teachers he uses make-shifts which lack the theoretical value of the things for which they are substituted. Outdoor work involves suspension of the time-table and hence the consensus of opinion is that expeditions should be occasional, and practical considerations imply that they should usually be made during the summer term.

Whatever outdoor work be done, there should be careful attention to one or two matters of importance: (*a*) the pupils should be informed precisely what they are to do, and if necessary elaborate time-tables and plans should be prepared to attain this end; (*b*) preparatory lessons should be devoted to the subject matter of the expedition in order that no time should be wasted; for an expedition is not to be looked upon as a means of introducing pupils to the study of a subject, but rather as a means of checking and verifying and expanding by personal experience what has already been learnt; (*c*) careful preparations should be made that necessary arrangements, such as the provision of facilities for meals, of facilities for transport, be made beforehand; (*d*) subsequent lessons should be devoted to the information obtained and the experiences gained so that the pupils may place the results of the expedition in correct perspective; (*e*) any subsidiary work which can be done for the benefit of correlated subjects in the curriculum should be knit into the main objects of the expedition, e.g. the collection of specimens for nature study, etc., observation of places of historical importance, sketches of bits of geographical or historical significance; (*f*) if the school has a Camera Club, it will be possible to associate photographic work with geography, and the expedition might also coincide in time and place with a meeting of the school Field Club. Should the expedition spread over more than one day, the preliminary preparations will be more extensive, and should the numbers be large, the assistance of one or more colleagues will be required.

Finally, the co-operation of the parents is necessary, so that the pupils may not stay at home, because the parent is indifferent. The School Journey, for particulars of which the teacher should consult the publications of the School Journey Association, is partly geographical, but many of the main features of such journeys are of little intrinsic importance beyond the general broadening of mind which follows from combined expeditions to distant scenes.

In this connection some teachers of boys are able by means of the organisation of the Boy Scout movement to make long journeys, even so far as the Black Forest, but the pupils who are able to participate in such extended journeys are not numerous and it becomes a matter for the teacher's consideration, as to the utility of directing his efforts to the benefit of a small portion of his pupils.

Outdoor holiday work. Outdoor holiday work falls into a somewhat different category. The work of the teacher is confined in this case to stimulating his pupils to the possibilities which lie before them, and in practice the last lesson before the holidays will usually be found sufficient for the purpose; while the first lesson after the holidays are over may be given to a talk about the places which the pupils have visited. One of the main features of such talks lies in the encouragement which the teacher may give to his pupils to purchase and use Ordnance Survey maps, no pupil should visit a new district without such a map and the teacher may easily arrange to purchase on behalf of his pupils the maps which they will need.

His stimulus will be specially directed to those pupils who use cameras, for with their aid he will be able to add to the school stock of lantern slides with the additional advantage that he will be able to know exactly the view point and range of the camera, without which a geographical picture loses probably half its value. The school museum should also benefit from the holiday trips of the pupils.

For holiday work it is usually advisable to suggest a series of possible ways in which pupils may occupy some of the time which they may find available. Some of these ways are:

1. Sketch mapping a brook or river, especially in relation to its banks, its cross-section, its rate of flow, its deposits of gravel, etc.
2. Sketches of coast scenery in relation to the lie of the strata, with an account of the formation of the beach.
3. An account of the occupations of the people, and the reasons which appear to induce these people to work in these ways.
4. The farm work of the district, including a study of the arrangement of the different crops in the fields, especially in relation to sunny slopes, and to woodlands.
5. Fisheries and the fish caught, and the disposal of the catch.
6. Canals, roads, etc. in relation to the lie of the land and the rocks of which it is composed.

7. The lie of the villages in relation to the hills and streams, as well as to the wells, and water supply.

8. The construction of a model of the district from the Ordnance map.

These models may consist of simple stepped models in cardboard, or of completed models in cardboard and plasticine, or in plaster of Paris. For these latter models the teacher should lend pupils some of the school modelling clay, which can be returned at the end of the holiday.

These are but some of the points to which the teacher can direct attention, others will suggest themselves in particular reference to the place to which the pupil is going.

In some schools, holiday work of this nature is stimulated by the offer of small prizes for successful work in one or more of these ways; while correlated work in nature study, in art, etc., is fitted to the general scheme.

CHAPTER XVII

TEST PAPERS AND EXAMINATIONS

Kinds of test papers. Test papers should be designed from two points of view: (i) as a test of work actually accomplished, and (ii) as a suggestion of further possibilities in development of lines of thought previously followed.

From the first point of view the character of the test paper will depend largely upon the stage which the pupils have reached, and the character of the individual questions will depend also upon the ability of the pupil to write adequately upon matters geographical.

In the early descriptive stage the question regarding the Polar shores might take the form : " Describe the country which Peary first explored "; later, during the same stage, the question could be asked in the form : " What do you know of the life of men in the tundra ? " In general, questions will tend to change from the minutely particular and definite to the more general form dependent upon the use of some technical geographical term which is in itself a generalisation.

During the transition stage, test questions will, as a rule, take very much the same form as the practical exercises which the pupils usually work, with this difference that while a practical exercise may take a considerable time for its completion, the question will be so arranged as to refer to data which are supplied in such a way that the question may be worked in about half an hour. For example, a practical exercise intended to teach contour lines would take much longer than a question on a simplified contour map, where the pupil is asked to perform certain very definite operations.

Similarly, a question on rainfall would only present sufficient data for immediate solution : e.g. the monthly rainfall values for two places could be given and the pupils might be asked to infer from the changes in seasonal rainfall the position of the places. The inference which would be made would only result in the use of such terms as " winter rain " or " monsoon rain " regions. In this connection a question might easily point to future work; the pupil who has just completed an investigation into winter rainfall conditions might be asked a question in which data referred to one place of winter rains and one place of monsoon rains, and be asked to emphasise the differences which he noticed. Although the pupil has not yet reached the stage when he has studied monsoon rains in detail, the exercise of comparison between the fact with which he is familiar and the fact which is in contrast with the familiar fact will serve as a means of intensifying his knowledge of the familiar fact as well as an introduction to the appreciation of the precise nature of the new circumstance, and such a question will serve as a stimulus to further study.

Questions on vegetation regions should involve the use of pictures: e.g. a picture of a tropical forest scene might be displayed in conjunction with a scene on a prairie farm, and the pupils should be asked to say where they thought they would meet with such scenes, and why.

The relation between rainfall, drainage and elevation might form the subject of an interesting test question of the following type:

> Examine the map supplied which shows the annual isohyets for 20, 30 and 40 inches, as well as the main rivers of the district and their tributaries. The place lies right in the track of rain-bearing winds from the west in the southern hemisphere. Draw the water-partings of the streams which flow eastward from those which flow westward, and shade the areas which are, in your opinion, elevated. Describe the relation of the rainfall to the rain-bearing winds, and to the

upland and mountainous portions of the country. (The middle portion of South Island, New Zealand, will suit such a question.)

Many questions should be asked which depend upon numerical data. For instance:

(i) County *A* has an annual rainfall of about 28 inches, a January temperature of less than 40° F. and a July temperature of more than 60° F., the wheat yield is over 3000 bushels per square mile of the area, that of oats is even greater: there are 169 sheep and 59 cattle per square mile of the county. County *B* has an annual rainfall of over 30 inches, a January temperature of more than 40° F. and a July temperature above 60° F., the wheat yield is under 450, and that of oats about 1850 bushels per square mile; while there are 398 sheep and 218 cattle per square mile of the county. County *C* has an annual rainfall of over 40 inches, a January temperature of just about 40° F. and a July temperature just about 60° F., the yield of wheat and oats is but a little less than that of county *B*, while there are 352 sheep and 240 cattle per square mile of the county. In county *C* there is a coal-field.

Which three English counties are they? Which of the three is best for arable farming and which of the three best for pastoral farming? In which county would you expect to find the densest population and the largest towns? What would you expect to be the main occupations of the people in each county? Why?

The particular advantage of this type of question lies in its definiteness and concreteness as well as in the brevity of the answers which are expected from the pupil.

> (ii) One quarter of the cotton workers of the United Kingdom live in the neighbourhood of town *A*: eastwards over the hills lies town *B* which is the centre of a district which contains nearly a third of the workers in the woollen trade and one fifth of the workers in the silk trade of the United Kingdom: north-westwards, part of the way over the sea, lies town *C* which is the centre of a district which contains three-fifths of the flax workers of the United Kingdom. What are the names of these towns; where are they? What names are applied to the districts in which these towns lie? Name some of the articles which are made in these towns, and state from which districts coal is obtained for the purpose of providing power for the factories in which these people work.

The above question might be asked as a test question towards the end of the transition stage for those pupils who had completed in this stage their studies of the British Isles and who had not yet met the numerical facts which are stated in the question.

Examination papers set by the teachers. Terminal and annual examination papers set by the teacher himself should contain questions of the same type as those enumerated above as well as questions requiring a certain amount of practical work: for example, a map might be supplied in which rainfall values were shown for a number of places and the pupils might be required to insert isohyets, or data might be provided regarding the world's growth of raw cotton and the pupil be asked to state in what climatic and vegetation district cotton might easily be grown: in this connection care would have to be taken to word the question so that the pupil might infer from the cotton growing in India and Egypt that cotton is not grown in the north and north-west of the United States, in fact, the pupil might be asked to draw a sketch map of the United States and to shade the portion in which cotton might in his opinion be grown. Another practical question might be of the type: "Examine the contoured map of Japan supplied and describe therefrom the relief of the land." In both these questions it is assumed that neither cotton growing nor Japan had been previously studied in detail. The main point about questions set by the teacher should be that while they serve as a genuine test of the work which the pupils have done, they also serve—because they deal with comparatively unstudied material—as a test of the pupil's power to deal with such unfamiliar material in a strictly geographical way. There is little value in a test or examination which depends for its results upon the memory which the pupils have of some work previously performed. Hence the futility, on the whole, during the descriptive and the transition stages in submitting the pupils to the test of an external examiner. All through both these stages the teaching will reflect the personality of the teacher who has been aiming at giving the pupil a geographical equipment of ideas and methods. Such an equipment does not submit itself readily to the test of an external examiner unless the latter takes the trouble to become intimately acquainted with the work of the school and the teacher.

- Consequently, if the pupils must be tested by an external examiner, the teacher should, at least, have the liberty of submitting not only his own syllabus of the work actually to be accomplished but also of describing his method of teaching and the method in which he proposes his pupils should be tested. Wherefore the necessity of the external examiner vanishes.

The external examiner. In relation to the argumentative stage, the position of the teacher in reference to the external examiner is quite different. At this stage the idiosyncrasies which are due to himself should have been counteracted by the breadth of subject matter investigated, and by the fact that his pupils have now been using their equipment of ideas and methods in acquiring facts and generalisations regarding the geography of the world for themselves. At this stage the pupil should have attained such a grasp of the geography of the world as it is usually taught in schools that they are ready for any external examination which is not set by an examiner of known peculiarities. Provided the examiner is a good geographer, *qua* geographer, the good teachers' pupils should be prepared for any test which may be placed before them. Should the examiner prefer verbal answers instead of answers displaying the facts in the usual geographical conventions, or should he prefer, on the other hand, knowledge of the shorthand of geography, the pupil should be quite prepared.

The external examiner represents at this stage the judgment of the outside world and that judgment at its best: consequently, the success or failure of the pupils as a general rule at this stage, which may be regarded as equivalent to the matriculation stage of the universities, is a reflex of the judgment of the world on the success of the teacher in equipping his pupils for their struggle in life. Here the external examiner is a necessity, for his annual survey of the work of the pupils tends to keep the teacher from letting his enthusiasms carry him too far from the steady routine track which after all is the main track for school work. Let the interest of the branch of the subject be never so great, the keenness and zest of the pupils never so manifest, the spectre of the external examiner and his verdict will suffice to cause the teacher to return in time to the more prosaic ways which he has momentarily left. Teachers whose enthusiasm leads them to seek after new methods of presentation, and new ways of approach to their subject which by lapse of time tends to become hackneyed to them, are rightly drawn back to the consciousness that after all the subject is only stale to them, it is new and novel to their pupils, and this is the main justification of the existence of the external examiner, a useful corrective, a discipline for the teacher.

CHAPTER XVIII

SELECTED EXAMINATION QUESTIONS

Specimen examination questions. In view of the fact that many pupils have to submit to external examinations, it has been thought advisable to summarise the kinds of questions which are asked in examinations in geography in relation to the three stages of teaching, and to offer in connection with these questions certain notes based upon the results of teaching experience. The questions which are given embody some which have actually been used in examinations, and it has been deemed best to classify them in accordance with the type of subject matter. No attempt has been made to give specimens which refer to a definite region or portion of the world, as the amount of detail expected in the answer usually makes all the difference between the answers to questions in general geography or to those on a small region.

Topography. There can be no doubt that the pupil should have a fair topographical knowledge; consequently, little comment is required upon questions designed to test that knowledge, except that such questions should refer to names of places of comparatively great importance, and should not be designed to give credit for a gazetteer-like acquaintance with names as names. Some little opportunity may be given for the pupil to use his judgment as in the case of question 3, Transition.

TOPOGRAPHY

Descriptive.

1. Where and what are Niagara, Superior, Chile, Jamaica, San Francisco?

2. Into what seas do the following rivers flow: Danube, Rhone, Elbe, Oder, Po?

3. What natural feature forms the boundary between (*a*) France and Spain, (*b*) Europe and Africa, (*c*) the United States and Mexico?

Transition.

1. Describe a barge journey from Rotterdam to the Black Sea, specifying the water over which the barge travels, the countries traversed and the towns passed through.

2. On the map provided (a mercator map of the world in outline) insert Buenos Aires, the river Mississippi, meridian 90° E., the tropic of Cancer. Name Japan, Ceylon, Denmark and Cuba.

3. Sketch a map of South America. Insert three rivers, shade and name three mountain ranges. Insert and name three large ports. Insert and number one parallel and one meridian. Indicate the scale of the map, approximately.

Argumentative.

1. Make a sketch map to indicate the position of the chief Alpine tunnels and passes; and indicate the importance of the various routes through the tunnels by showing the chief cities thereon.

2. Make a sketch map to indicate the routes of transport of wheat from Winnipeg to (i) New York, and (ii) Montreal.

3. Make a sketch map of Africa to show the various divisions of the country and indicate the Empire of which each division forms a part. Insert the chief town of each division.

4. Sketch a map of Australia to show the chief railway lines. Mark thereon the limits of the desert and indicate clearly the lines which are mainly intended to connect mining towns with the coast ports.

Map-making and map-reading. As a general rule too little is made in examinations of the pupil's ability to make and read maps; yet in school examinations great importance is attached to practical science, to conversational ability in modern languages and to work in art.

It may be suggested that there is little need for the examiner to set questions involving a test of the pupil's ability to make maps, since he expects illustrative sketch maps to accompany the answers to most of the questions which he propounds. The teacher's experience, however, shows that children are apt to ignore maps, and to evade the use of illustrative sketch maps, hence it becomes a matter of some importance that in the external examination the pupil should be compelled to attend to this aspect of geography, so that he may feel that, after all, the map is at least as important as the verbal portion of the answer. In regard to the fact that the child has been trained in the use of geographical shorthand, and that, consequently, a map contains so much more information than a verbal answer, it may be suggested that examiners should indicate to examinees that answers to the map questions are compulsory and that no purely verbal answer can be considered as satisfactory. Some map or diagram must be used as illustration.

MAP-MAKING AND MAP-READING.

Descriptive.

1. In cycling through the village of *A*, I ask my way to the village of *B*. I receive the following instructions: "Go down this street as far as the bridge, about half a mile away Cross the bridge and turn sharp to the left and follow the road by the banks of the stream for about a mile until you come to the cross-roads. Turn to the right, leaving a second bridge over the stream behind you and you will find the road goes through a wood about a mile away. Take the second road to the left in the wood, cycle for half a mile, cross the railway bridge, turn to the right for a quarter of a mile and you will be at the railway station at *B*." Draw a rough map to illustrate these directions.

2. Make a sketch-map to show the position of your school in relation to the nearest church, railway station, and police station.

Transition.

1. An island is roughly oval in shape and its greatest length is three times the widest part. The island is longest from east to west. The north part of the island rises steeply from the shore to a height of over 900 feet with two peaks

near the middle of the ridge each over 1000 feet separated by a saddle which drops to 500 feet. From the top of the saddle a short rapid steep-banked stream runs northward into a little bay almost land-locked by headlands over 300 feet high.

The southern slopes of the ridge are gentle and a stream flows down from the saddle southwards to the coast plain, below 200 feet, which is about a third of the width of the island. The stream flows across the plain eastward by a meandering course and eventually runs into a wide sandy shored bay shaped like a crescent moon.

The south side of the stream rises gently to about 400 feet and then drops gently to an unbroken shore line. The western point of the island is a bold promontory 400 feet high which is separated by a dip from the main ridge.

Draw a sketch map and indicate by contour lines these features of the relief of the island

2. Examine the contour diagram provided. Make a section along the line *AB* in the space provided. Why is *C* invisible from *A* ? Describe, or sketch, the view southwards from *D*. How far by an air line is *D* from *B* ?

3. Describe how you would proceed to make a map of a small island. Specify what instruments you would use.

Argumentative.

1. The map provided is part of sheet   of the Ordnance Survey.

Describe the physical features of the land in the area of which *A*, *B*, *C* and *D* are the corners.

Two routes are shown from *A* to *E* ; one through *B* and the other through *F*. Choose one of them and make a profile sketch to a rough scale to indicate the changes of slope on the route : if you can walk at 3 miles an hour on level ground, 4 miles an hour downhill and 1½ miles an hour uphill, how long would you be in walking from *A* to *E* ?

Name a river which has a steep-sided narrow valley.

2. The map provided shows the isobars for a winter day over the British Isles. Insert wind arrows and state where you would expect to find that rain had fallen. What would

be the direction at the town in which you live? Would the wind be cold or warm, wet or dry?

3. The map provided shows the average rainfall for Asia for the period May to September. Insert on the map the prevailing winds of the region at this season. Describe the rainfall of India and contrast it with the rainfall along the Arctic shore-lands so as to illustrate the causes for the facts which you state.

4. The map provided shows the average isobars for the Indian Ocean in July Insert wind arrows, shade the land areas where you would expect rain to fall in July. Mark on the map the probable tracks of sailing vessels (i) from the Cape to Calcutta, (ii) from Bombay to the Cape.

5. The map provided shows the annual isohyets for South Island, New Zealand. Insert the prevailing winds and indicate the areas of mountain in New Zealand so as to show why the heavy rains fall where they do and why desert conditions prevail in the south-east. Write briefly any explanations you think are necessary.

6. The map provided indicates the limits of extensive production of rye, wheat, figs, timber in Europe. Indicate on the map the climatic factors which account for these limits. Add a brief note, if necessary, to explain the meaning of any conventions which you may use.

The use of pictures. Pictures are of the greatest assistance in teaching, yet to the writer's knowledge in no English examination have questions been asked in reference to pictures. In the Antipodes, it is usual to set one question with reference to a pair of photographs reproduced upon the examination paper. Such pictorial matter will be best used at the earliest stages and it is difficult to imagine a question, which would be fair, and yet require a sufficiently detailed geographical knowledge as to make the question suitable to the argumentative stage.

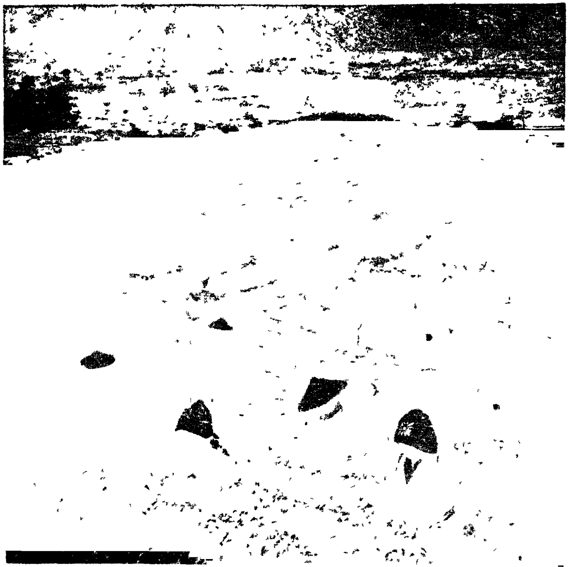

Fig. A For questions on p. 177.

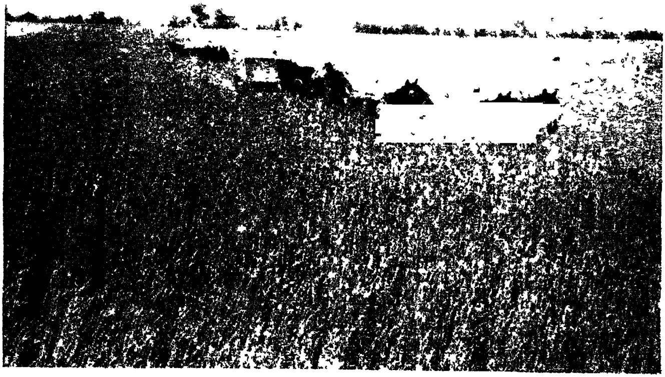

Fig. B For questions on p. 177.

THE USE OF PHOTOGRAPHS.

Descriptive.

(A photograph of an Eskimo, an oasis showing people, a street in a British town, men felling a tree in Canada, etc., is printed on the examination paper.)

Examine the man (or men) in the photograph. In what part of the world does he live? How does he spend his days and obtain his food? What kinds of clothes does he wear? Why? When he makes a journey how does he travel?

Transition.

(Two photographs showing men at work in connection with a main vegetation region or at some distinctive occupation are printed on the examination paper to serve as contrasted indications of human activity, e.g. a lumber raft in Canada, contrasted with Japanese planting rice or a British pit head with miners contrasted with men sorting fish on the quay at Grimsby. No legend is attached to the photographs.)

What are the men doing in (*A*) and in (*B*)? In what part of the world would your expect to find such men? What explanation can you offer why men work at such occupations?

Relief and land forms. Questions on relief may be asked during the two later stages, the answers to the questions will show different powers of appreciation of the surface relief of the earth. Some questions upon relief should be based upon maps supplied to the candidates, but others may refer to the more general nature of the relief of large areas of land, which are too large to be treated adequately in a single map. Such questions are too difficult for the descriptive stage.

In the argumentative stage it is suggested that the questions which are set should refer to a definite and precise example of some general formation; e.g. in question 2, the candidate is asked to refer to the lakes of the Shannon, the lakes of Canada and Scotland, in the expectation that his answer will indicate a knowledge of the different types of lake which occur in nature. Such a question appears more suited to the adolescent intelligence than a question such as "Describe the various types of lakes." By asking the question in so definite a manner as suggested, the examiner should obtain much better results, since candidates must refer in their answers to definite lakes and cannot submit an answer couched in general terms, which leaves the examiner wondering whether the child is automatically reproducing some information which he has learnt more or less by heart; the examiner will be able to determine more easily what the candidate knows and also what he does not know when questions are referred to definite geographical facts.

RELIEF AND LAND FORMS.

(See also contoured maps.)

Transition.

1. Draw a sketch map of France or north-west America and indicate the highlands by shading to show how the slopes of the land govern the present river systems. Insert the chief rivers.

2. Describe as briefly as possible a walking tour across the south of England from London to Brighton. Illustrate your answer by a sketch map showing the hills and lowlands, the scarps and the rivers.

3. Describe the relief of south-west Ireland or Argyllshire in contrast with that of Lincolnshire and Norfolk to indicate the reasons for the different trend of the coast lines.

Argumentative.

1. Draw a profile sketch of the Nile to indicate the chief changes in the slope of the river bed. Why do the cataracts

occur? Why is the slope below the cataracts steeper than that immediately above?

2. What kinds of lakes are those of the Shannon? What Canadian lakes are of the same kind? Contrast this kind of lake with the lakes of the Grampians. Where in Europe are the lakes similar to those of the Grampians?

3. Describe, and illustrate with diagrams, the valleys of the rivers which join to enter the sea near San Francisco. Sketch the appearance of the coast line if these river valleys were drowned by a rise in the level of the sea. What other portions of the Pacific coast resemble this formation?

4. Sketch the United States coast line from Charleston to New York, carefully inserting Chesapeake Bay, Cape Hatteras, Long Island. Can you offer any explanation for this embayed coast line? In what parts of Europe is the coast line similar?

5. Describe (i) the Appalachians and the Atlas; or (ii) the Alps and the Caucasus; or (iii) the Norwegian Heights and the Laurentian Heights; or (iv) the Drakensberg and Australian Alps; in such a way as to emphasise their similarities.

Climate. Questions dealing with climatic conditions should be very definite: climatic factors tend to be the least real of all geographical controls. Averages, long period changes, numerical data, tend to obscure the reality of this element in the human environment, and since these signs and symbols occupy a dominant position in the geographical account of climate, it is essential that the minds of the pupils should be carefully directed towards the underlying and determinant causes which limit and straiten our lives.

Experience shows that pupils do not attain to a thorough grasp of the significance of climatic investigations easily, and the examiner should afford the candidate every facility towards avoiding the wordy reproduction of trite explanations learnt by heart, and towards the manifestation of a real grasp of the definite conditions which are summed in the word climate. It is a mistake to ask for an account of the climate of a town, for the child should not know sufficient detail to enable him to answer such a question: climatic conditions should be presented to the child in relation to large areas, with reference to broad distinctions. Above all a climatic question should be suggestive of the effects of the climatic controls on the life of man: if the question be complete without the reference to man, yet the justification for asking such a question should be that the answer is of value in the explanation of certain phenomena connected with the life of man.

CLIMATE.

(See also map-reading, isobars, etc.)

Descriptive.

1. Are mountains wetter or drier than the neighbouring lowlands? Why?

2. England is not so warm as Italy Why? Which country is warmer India or Japan? Why?

Transition.

1. What parts of the British Isles are: (i) coolest in summer, (ii) coldest in winter, (iii) rainiest; (iv) sunniest? Why?

2. What are isotherms? Draw a sketch map of Great Britain and show the January isotherm 40° F.

3. How is rainfall measured? How are rainfall facts recorded on a map? Show, e.g., how you would record the fact that part of Great Britain had an annual rainfall of less than 30 inches and other parts had a heavier rainfall than this.

4. Two places *A* and *B* have the following variations in temperature and rainfall.

		Jan.	Feb.	Mar.	Ap	May	Jun	Jul.	Aug	Sep	Oct	Nov	Dec.
Temp.	*A*	−4	−2	15	39	52	62	66	63	54	41	21	5
in ° F	*B*	52	53	55	59	65	71	[illegible]7	79	74	67	59	54
Rain in	*A*	1	1	1	2	2	3	3	3	2	2	1	1
inches	*B*	4	3	4	3	1	½	—	½	2	4	4	4

State the districts in which these places might be, giving reasons for your answer.

Argumentative.

1. Compare the climate of: (i) the Mediterranean with that of the British Isles; or (ii) Cumberland with that of Essex; or (iii) the plains of the Ganges with that of the prairies of Canada.

2. What are the distinctive features of Monsoon, Mediterranean, and equatorial rains? Why do these types of rainfall differ? Name two districts where each type of rainfall prevails.

3. Describe the various kinds of climate met with in a traverse of: (i) Africa from Cairo to Cape Town; or (ii) Asia from Ceylon to Omsk; or (iii) Australia from Melbourne to Port Darwin.

4. Draw a sketch map of South or North America. Indicate on the map the climatic divisions of the country. Insert the prevailing winds, noting any seasonal variations which occur, and write a brief note explaining the climatic effects of the winds and indicating, also, the effect of the relief of the land upon the climate.

Vegetation. Questions dealing with vegetation, whether natural or cultivated, should look backward as well as forward; they should imply or demand attention to the climatic control, and equally they should imply or demand attention to the results which climatic controls yield to humanity. Equally with climatic questions they should be definite, the examiner should call the attention of the candidate to some definite area in the world, so as to prevent, so far as is possible, the vague generalities which appear to many children as satisfactory answers to such questions.

It should be understood, here as elsewhere, that even if a sketch map is not specifically demanded, an answer which lacks such a map is not satisfactory.

VEGETATION.

Descriptive.

1. Describe the variation in the vegetation to be met on a journey from the mouth of the Nile southwards in a straight line to Cape Town.

2. Describe the variation in the vegetation to be met on a journey due north from Calcutta to the shores of the Arctic Ocean.

3. Why do the Irish breed many cattle instead of growing wheat like the people of Cambridgeshire ?

4. Why do the people of Italy use olive oil instead of butter and drink wine instead of tea ?

Transition.

1. Draw a map of Africa. Mark the districts of winter rain, very little rain indeed, summer rain, very heavy rain; indicate in these districts characteristic natural vegetation. Write a brief note to show how people cultivate different useful plants in some of these districts and state where cultivation is impossible.

2. There are two main kinds of forests in the world, near the equator and near the Arctic Ocean. Describe the situation of these forests, and explain what is the main climatic cause of their growth. What useful products do men collect in these forests ?

3. Much wheat is grown in the United States ; many sheep are reared in Australia ; many cattle are reared in the Argentine. What great natural vegetation region has been altered to suit these forms of human activity ? What is done with these products ?

4. India grows one-third of the world's tea ; Brazil produces four-fifths of the world's coffee ; the United States produces three-fifths of the world's cotton. What are the main climatic conditions under which these crops are grown ? If the land were not cultivated what kind of vegetation would grow there naturally ? Why ?

Argumentative.

1. What do you understand by a natural region? Choose one such region and explain definitely the reasons why such an area is specially marked out in regard to surrounding lands.

2. The Mediterranean shore-lands are regarded as a great natural region. Point out clearly how the vegetation of this area is unique; and specify how the factors of relief, climate and human labour combine to produce the result.

3. India produces one-third of the world's cane sugar; Germany one-third of the world's beet sugar[1]. Point out the main climatic, vegetation and human reasons for these facts. What happens to the sugar so produced?

4. Estimate approximately the shares of the world's wheat crop of the five or six main producing areas. Point out the climatic factor which controls this production, specifying the times of sowing and reaping and distinguishing between winter wheat and spring wheat. Under what climatic disadvantages does the wheat grower in England labour? Compare the value of the yield of wheat per acre in Russia with that in the United States and point out the climatic and human reasons for the difference.

Minerals. Mineral deposits are of little geographical importance unless these are worked. A farmer in the Scottish lowlands may send his plough within ten feet of a deposit of oil-shale sufficiently rich in oil to make his fortune, yet until he discovers the deposit and works it he has a farmer's income, he lives a farmer's life. From the facts which are brought to light in the geological survey of a country it is frequently possible to state that a country is rich in zinc, or lead, etc.: but when the statement is made, it can have little value either in a geography text-book or in an answer to a question in the examination room. Questions upon minerals should therefore be related to human labour, and should be postponed almost entirely to the argumentative stage, since they usually demand a comparison between the yield of this, that or the other deposit.

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[1] Geographers will, of necessity, refer to Germany, Belgium, etc., as they were in 1913 and previous years. The war changes will hardly affect the teaching for ten years.

It is usual in geographical books to ignore the mineral wealth of Bolivia, one reads but occasionally of the mines of Potosi ; and such scant treatment is wise, for this potential wealth or this fabulous store of precious metal is of little account in the world of men since it is almost as far removed from the busy world as if it lay under the frozen vastnesses of Antarctica.

MINERALS.

Transition.

1. Where is iron ore obtained in Britain ?

2. Draw a sketch map of Britain and insert the districts where coal is mined.

Argumentative.

1. What proportion of the world's coal is mined in Britain, Germany and the United States ? To what countries does Britain export coal ? Why do Germany and Canada both import and export coal ? Whence does France obtain coal to augment her own supplies ?

2. What are the chief countries in which (i) gold, (ii) copper, (iii) tin are mined ? Why has Cornwall ceased to be a tin mining district of importance ?

3. Trace throughout the American continent the mining districts in relation to the mountain areas which border the Pacific Ocean. Indicate the mines which suffer from transport or climatic disabilities.

4. In many countries railway lines have been built almost entirely for the use of mining towns and their ports. Give instances of such railways in Australia, South Africa and South America.

5. Account for the fact that maps frequently show mineral deposits which are not worked or only slightly worked : e.g.

iron ore in New Zealand; coal in China and India. Indicate some reasons why these deposits are not mined.

6. Give an account of the quarrying for iron ore in the Lake Superior district. Indicate the special ways in which the Americans have overcome the difficulties of (i) shortage of labour, (ii) distance from iron manufacturing centres in order to make this quarrying profitable

Manufacturing. In connection with industrial processes more than in any other connection care is required in setting examination questions. It may be assumed that man works to live; it may, further, be assumed that man will work at whatever employment he finds within his neighbourhood to pay him best. It may be generalised that in most districts there will be some farmers, some smiths, some tailors, etc. It is safe to infer that in a city of the size of Melbourne there will be many workshops and many factories, combining to supply some of the needs of the people who inhabit the city.

A distinction has been drawn between groups of people such as the nomad steppe-dwellers who form an almost completely self-contained community and the ranchers of the American prairie, or the shepherds of New Zealand: the work of the latter is important for the world as a whole.

Similarly, in connection with industries a distinction should be drawn between those towns in which there are industries of local importance and those which supply a wider area. This broad distinction is important for school geography, since school geography can, at most, only find time for one or two investigations into the geographical circumstances which govern industries on the local scale, and since these inquiries are limited and particular they do not furnish material for any conclusions about other districts. Hence geographical questions dealing with manufactures should deal with manufactures on the large scale, and, therefore, in relation to the wide outlook which has characterised the work on climate, vegetation, etc. The touchstone throughout is relative importance to the rest of the world.

MANUFACTURING.

Descriptive.

1. Name the chief occupation of the people in New Zealand, British South Africa, Ceylon, Argentina, Lancashire, your own town.

2. How is it that many people in: (i) Bradford make woollen cloth, (ii) Grimsby are fishermen, (iii) Belfast build ships, (iv) Swansea smelt copper, (v) Stoke make pottery?

Transition.

1. What is the chief occupation of the people in addition to coal-mining on the following coal fields: Lancashire, South Staffordshire, Durham, South Wales?

2. What is the chief industry in Cleveland, Renfrewshire, Dunfermline, Yarmouth, Reading?

Argumentative.

1. Compare Pittsburgh and Middlesborough as iron making centres in regard to supplies of raw material.

2. Why are cotton goods made in Lancashire and not in Cambridgeshire, in north-east France and not near Bordeaux?

3. Why are the chief flour mills of Britain at such ports as London, Hull and Liverpool?

People and occupations. It has been convenient to treat of climate, vegetation, etc. separately, but it is important to bear in mind that the value of a question on climate or vegetation depends upon its implication of importance to man: hence though the examiner may prefer to test the pupil's knowledge piecemeal, it is important that some question should be set in the paper which tests the ability of the pupil to demonstrate the connection between climatic and other controls and the life of man. It is usual to place such questions in the particular portion of the examination paper which deals with the area set for detailed study, but it is possible to ask general questions which make the same test.

Hence a question dealing with the occupations of the people may refer to two classes of people, those who are of importance geographically because their lives illustrate in a simple way the prevalence within the world of human endeavour guided and controlled by external agencies, and those who are engaged in an occupation of world-wide importance since the produce of the workers is needed all over the world.

PEOPLE AND OCCUPATIONS.

Descriptive.

1. Contrast the life of an Eskimo with that of a farmer in the Canadian prairie.

2. Why are there so few people in the desert of Thar in the valley of the Indus and so many people in Bengal in the valley of the Ganges?

3. Contrast the life of an English workman with that of a collector of rubber.

Transition.

1. Account for the fact that English people are crowded together (*a*) in London, (*b*) on the coal fields.

2. Compare the life and work of the people who are engaged in (i) lumbering, (ii) ranching.

3. Explain the difference in the density of the population, (*a*) between Belgium and Russia, (*b*) between Labrador and Pennsylvania and New York States.

Argumentative.

1. Draw a sketch map of the basin of the Trent. Indicate the chief centres of the population and the districts where

the population is very sparse. Insert the Erewash, the Derwent.

Explain carefully the factors which have caused the scanty population to remain scanty and the dense population to become more dense.

2. Estimate the relative position of British agriculture in comparison, (i) with other British occupations, (ii) with agriculture in France and the United States.

Indicate briefly the changes which have occurred in the relative position of the British farmer since 1881.

Explain the factors which have governed the changes you mention.

3. Explain in detail why the population of the United States is roughly 14 times as dense as that of Canada; pointing out the circumstances in which these two countries are essentially similar and essentially different.

Trade and communications. More and more since 1881 has the world advanced in trade and transport: more and more men are earning a livelihood in connection with the exchange of goods between producer and consumer. Smaller and smaller has the business world grown, less and less important have political boundaries become. Hence the importance of questions upon trade and communications.

No country is so dependent upon both its exports and its imports as the United Kingdom, and therefore questions upon exchange and transport have a double importance to the British child: they lay bare the main-spring of our national well-being, and they summarise in themselves the whole geographical story. What is the value of a knowledge of the relief, the climate, the vegetation of a foreign country or of a distant county, unless it leads to the knowledge that the people in that distant land are constrained by their circumstances to co-operate with us, as we must co-operate with them?

Hence, questions on trade and transport should be set, firstly, to summarise the effect of the geographical controls in the land of origin, and secondly to demonstrate the value which man's effort in relation to those controls has for the world at large and for us in particular. What value have the canals of England when the railways have usurped their place and when the roads bid fair to render them entirely useless?

TRADE AND COMMUNICATIONS.

Descriptive.

1. What do you understand by: a port, a railway junction, a dock, a goods train, a mail steamer?

2. How is it that there are so few railways in Australia and so many in the United States?

3. What are the five chief manufactured articles which are exported from Britain?

Transition.

1. Specify the sources of British supplies of wheat, wool and timber or of meat, cotton and iron ore.

2. Draw a sketch map to indicate the countries to which British coal is exported. Do any of these countries mine coal as well as buy it? If so, indicate the position of the coal-mines.

3. Draw a sketch map to show: (i) the ferry towns of the English Channel and the North Sea; or (ii) the land and sea routes from England to Japan; or (iii) the round the world route from London to New Zealand and back.

Indicate carefully the situation of the ports and the routes followed by passengers and goods.

Argumentative.

1. Account briefly for the main facts of the world's wheat trade: indicating both the countries where wheat is grown and the places to which the wheat is sent for consumption.

2. Account briefly for the world's trade in coal; indicating where coal is mined and where consumed.

3. Give details of the traffic of the North Atlantic Ocean: specifying (i) the interchange of commodities between North America and Western Europe; (ii) the goods which leave the North Atlantic Ocean for countries bordering other oceans; and (iii) the goods which are sent into this ocean from these other countries.

Towns and their location. It has become fashionable, as will be seen by the numbers of towns named in the specimen question, to ask examination candidates to make certain remarks about the location of towns and cities. This fashion is to be deprecated: first of all on practical grounds, the teacher does not know precisely how much the pupils are expected to say, since the location of each town rests almost entirely upon particular and local circumstances; and secondly, because the adequate reply to such questions is not necessarily geographical, but refers largely to historical facts.

The teacher may feel that he could write a magazine article upon the location, say of New York, and then only touch the outline of the subject: what are his pupils to compress into half a dozen lines?

It may be possible to account for the situation of Esquimault, or of Johannesburg, of Yukon or Kalgoorlie, within the limits of space allowed, but what impression is left on the mind of the pupil when he is asked to account for the situation and importance of Moscow, Baghdad, or Constantinople in the same space. Such questions encourage slipshod thinking; or, if the teacher takes a high view of his office, his pupils will reproduce a tabloid of information learnt by heart if he has had the luck to anticipate the question on town sites with success. Even where the geography syllabus names, say, ten towns of which the location had to be studied in detail, it would be unwise for the examiner to test the knowledge of the pupil by the fairly vague type of question which is usual to-day; he would devise some more precise and definite test.

If such questions are mere variants of the question "Name the chief town on the south-east Lancashire coal field" or the question "Indicate the position of the chief port on the south coast of England" they are to be condemned, because they make a pretence of asking for information which the pupil cannot be expected to possess.

TOWNS AND THEIR LOCATION.

Descriptive.

1. Name towns in the British Isles in the following situations:

(*a*) Where a tributary joins the main stream

(*b*) Where a river makes its way by a gap through a hilly ridge.

(*c*) Where a railway and steamer route meet.

(*d*) Where a river is bridged nearest to the sea.

2. Name three important towns in England which are built at the mouths of rivers. Describe the position of each town, and state why the town is important.

Argumentative.

Describe the positions and point out the natural advantages or disadvantages of Limerick, Genoa, Lyons, Stockholm, Moscow, Baghdad, Lhasa, Singapore, Vladivostok, Yokohama, Cairo, Khartum, Lagos, Grimsby, Wolverhampton, Wigan, Portsmouth, Birkenhead, Winnipeg, Denver, Halifax, Colon, St Louis, Charleston, Quebec, Odessa, Kimberley, Sydney, Hongkong, Southampton, Chicago, Vancouver, New Orleans, Leeds, Belfast, Kingston, Newcastle-on-Tyne, Venice, Montreal, Panama, Cape Town, Tokio, Quito, New York, Irkutsk, Bombay, Cardiff, San Francisco, Constantinople, Swansea, Pittsburgh, Johannesburg, Belfast, Vienna, Bangkok, Canton, Hankau, Minneapolis, Los Angeles, Galveston, Seville, Adrianople, Valetta, Esquimault, Brisbane, Rio de Janeiro, Valparaiso, Denver.

CHAPTER XIX

THE GEOGRAPHY ROOMS

An ideal scheme. In presenting the following suggestions for the provision and equipment of the geography rooms, it will be well to state that the scheme propounded represents a much more complete and thorough arrangement than any which has yet been placed upon record[1]. Yet despite the fact that the present writer has not yet been so fortunate as to work in a geography room it is possible that the plans which he hopes one day to put into operation will be sufficiently suggestive to provide ideas to teachers in general.

The size of the rooms. The main geography room, Fig. 11, should be twice the size of an ordinary class-room and should lead into three smaller rooms—a clay room, a store room, and a dark room. After many years of experience it is possible to state definitely that work in a class-room of ordinary size, away from store rooms, map cupboards, etc., involves a waste of time and energy which may be estimated at about one quarter of the teacher's value. Where geography is taught for two periods a week, the provision of a room well furnished and arranged is equivalent probably to the granting of a third period to the subject.

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[1] For rooms which are actually in use the teacher should consult back numbers of *The Geographical Teacher*.

The main room. This room should contain desks sufficient for an ordinary class lesson and bench accommodation so that all the class may have sufficient space for individual work with large scale maps. There should be a liberal provision of wall-space and cupboards. Fig. 11 indicates a suggested arrangement. The three benches should be 2′ 9″ high; one bench should have below it a series of slots to hold thirty drawing boards, the other benches should have nests of drawers of varying depth but long and wide so that large flat maps, large sheets of drawing paper etc. may be conveniently stored. Under the windows there should be a supplementary drawing table with sloping surface which can be let down against the wall when not in use. The party-wall will provide space for many cupboards to contain the reference books, the library books, the museum and various other pieces of apparatus such as small models and globes. The book and museum cupboards might have glass doors, but the other cupboards might have specially made doors with a flat surface covered with green baize so that they might be used for the display of maps, photographs, etc. Other spaces on the walls might be fitted with baize-covered panels for the same purpose.

The teacher's demonstration bench should be placed facing the desks of the pupils. The lantern should be placed in a well in this bench so that the

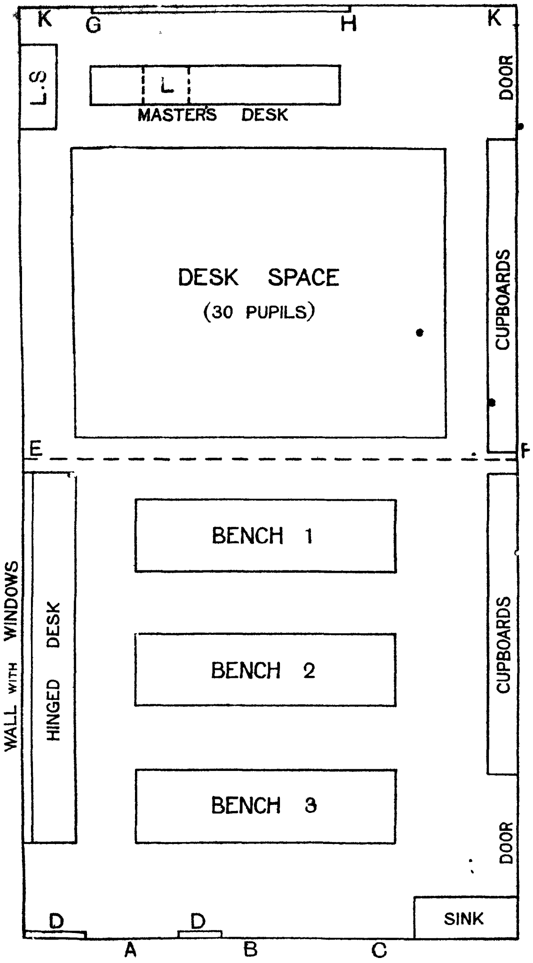

Fig 11 The Geography Room.

A	Door to Clay Room.	GH	Wall Blackboard.
B	Door to Dark Room.	K	Map Rack
C.	Door to Store Room.	L	Lantern Well in Master's Desk.
D.	Wall Notice Board.	L S.	Lantern Slide Cabinet
EF	Movable Partition.	M (Fig. 12).	Corner Map Hanger.

projected image may be reflected on to the lantern screen from an adjustable mirror placed between the pupils' desks and supported from the floor.

Such a position involves the provision of a solid lantern screen sloped outwards from and fastened to the wall behind the teacher and above the wall blackboards (Fig. 12). The remainder of the bench should contain drawers and small cupboards for the teacher's use. By the side of the demonstration bench there will be room for the nest of drawers containing lantern slides. There should be a liberal provision of such drawers to facilitate ease in picking out lantern slides quickly.

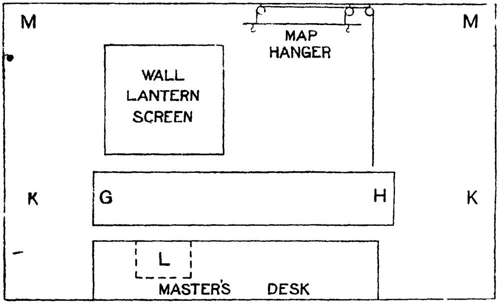

Fig. 12. End Wall of Geography Room.

The remainder of the wall (Fig. 12) should be arranged with racks for wall maps and from the ceiling should be suspended apparatus for displaying wall maps; there should be at least two pieces of such apparatus, one may be arranged across the corner of the room.

The clay room. This room should be about half the size of an ordinary class room and should contain

(i) a clay box; (ii) a working bench, (iii) boards on which to make models, (iv) a rack for holding models in process of construction, (v) a sink with water laid on, (vi) a fair portion of free floor space, (vii) pegs on which to hang aprons and overalls, (viii) storage room for buckets. This room should be well lit and ventilated. The floor should be concreted and a drain should be provided.

The dark room. The dark room should be fairly small, lit by windows from either the store room or the clay room. These windows should be arranged with a cover so that (i) red light, (ii) yellow light, (iii) no light, can be admitted to the room. There should be a sink, artificial light within a red glass case, a bench, cupboards and shelves. Ventilation should be arranged with particular care so that air but not light enters the room freely. Every surface in the room should be either black or dark in colour. The floor should be concreted and a drain should be provided.

The store room. This room should be as large and as well lit as possible. There should be provision for photographic chemicals by means of shelves, for moulds and models by means of a set of compartments without doors, for plaster of Paris in a dry place. There should be a set of drawers to hold the school stock of photographic negatives, and cupboards to hold books, surveying apparatus, etc.

Lighting. Daylight should be excluded from the main room from any other source than the windows on the outside wall of the building. These windows must be fitted with an arrangement so that light may be shut out quickly and effectually. If possible, the artificial light should be electric; no other method is so convenient.

The control switches for these lights should be fitted to the teacher's bench near the lantern well. Above the teacher's bench there should be adjustable shaded lights so that (i) hanging wall maps may be illuminated easily; (ii) models on the teacher's bench may be illuminated at will; (iii) a dim light may be projected over the class when the lantern is in use without illuminating the lantern screen. Spare plugs should be placed conveniently in the working benches so that extra light may be obtained for delicate map work during the dull winter afternoons.

CHAPTER XX

APPARATUS

Outdoor work. Apparatus for use out of doors consists largely of the instruments which are used in connection with climate and map-making.

The essential climatic instrument is the rain-gauge, but it is desirable that in addition there should be maximum and minimum thermometers, and a barometer. Each pupil should have some practice in recording variations of temperature and rainfall, and should take the observations for at least a fortnight. The systematic method to be adopted in this connection depends upon the ability of one pupil in each class, since it is advisable that one pupil should superintend the reading of the instruments and the resetting of the two thermometers. One caution may be noted in this connection, there should be no attempt to make the school into a meteorological station unless arrangements can be made for careful supervision of the readings as well as for reading the instruments during the week-ends and the holidays. Geographically, so long as the pupil knows how the records are taken, there is little need that he should spend any great amount of time on meteorological observations.

It is sometimes useful to set up a home-made rain-gauge for the use of the junior pupils. There occurs a certain amount of overlapping, here, between physics and geography and therefore there is need for an agreement between the physics and geography teachers.

For map-making purposes the main pieces of apparatus are tapes, chains, surveyor's poles, drawing boards, spirit-levels and one or more plane-tables. Plane-table exercises are probably the maximum limit to which school pupils should go in surveying ; and it seems possible to begin the work in connection with triangulation in a very simple fashion with a drawing board and two three-inch pins set up near the edge and at the ends of a ruler. Quite satisfactory results can be obtained with such a piece of apparatus, and the use of such simple materials makes it possible for many pupils to perform the same exercise in the field together. The main point about the exercises with the plane-table consists in the use of triangulation to fix the position of a third point in relation to a measured base line ; when the pupils have done such work they have finished with plane-tabling as a practical exercise in geography.

When it is necessary to mark out the school field for the annual sports it is then possible to utilise the knowledge which the pupils have gained and to allow a class to set up the marks which determine the various running tracks.

In addition to triangulation in a horizontal plane it is wise to attempt the determination of heights by means of triangles. For this purpose a home-made jointed rod, consisting of three pieces of wood jointed together by screws which can be tightened at will is sufficiently elaborate. One rod is set at right angles to the middle rod, and by means of a plumb-line this rod is held vertically so that the middle rod is horizontal. The third rod is then adjusted to point to the point of which the height is to be determined, and the angle between the third and second rods is then measured with a protractor

A second angle is measured in the same way at the other end of the measured base line and the data are obtained for the triangulation both by measurement of a drawing to scale and by calculation which will give the required height. Some of the smarter pupils may check the results which they obtain with an angle meter.

More advanced field work. In rural schools the geography course may reasonably include more advanced work in surveying and map-making. For this purpose the school should contain a complete set of model surveying instruments such as that designed by Mr E. A. Reeves[1].

These instruments are models of the instruments used in actual field work, and include a sextant, artificial horizon, prismatic compass, a theodolite and a dumpy level. Complete instructions regarding the use of the instruments can be obtained and the older boys may reasonably spend an afternoon or so surveying the neighbourhood of the school.

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[1] Teachers should write for particulars of these instruments to Messrs George Philips & Sons, Fleet Street, E.C.

In cases where the determination of a contour line in the field is desired with a fair degree of precision, a home-made water-level may be used. This water-level consists of a pair of tubes connected by means of india-rubber tubing and adjusted to the standard. By sighting along the levels of the water in the two tubes an air line of a definite height can be obtained and poles can be set up in correct position to mark points which have the same level, i.e. the same elevation, as the water.

Class-room work. The most important piece of apparatus for work in the class-room is the atlas, and the main feature of the atlas lies in its index of place-names. The maps which are required for reference in the atlas are relief maps on the coloured layer system, political maps to match the relief maps, maps showing isotherms, isohyets, isobars and wind directions, and distribution maps showing the areas in which the main commodities of the world are produced, and maps showing the natural vegetation conditions which prevail in the separate countries of the world. It is highly probable that most maps in the atlases in use in schools contain too many names, while the index is too small. If the map-maker would insert fewer names on the maps the names which school pupils should know would be more easily visualised in position, and the odd names which the pupil may require for occasional use but not to be learnt should be inserted in the index with their latitude and longitud The occurrence of so many names encourages pupils to search the map for the place rather than use the index.

There should be available for use when required wall maps to match the maps in the atlas, loose sheets from the *Atlas of the World's Commerce* and from the *Atlas of Meteorology*, and loose sheets of large scale maps for reference and use. These loose sheet maps should be collected by the teacher during the course of the work and the particular sheets of the Ordnance Survey, for example, which he requires will be largely a personal matter determined by the districts within the United Kingdom with which he is personally familiar.

There should be a black globe with the continents outlined in white, and one or two other globes of different sizes with (i) political markings, (ii) relief colouring, and (iii) isotherms and isohyets, annual.

There should also be a collection of geographical pictures, and these pictures should include some specimens of the art of various countries in relation to landscapes; i.e. some pictures should be by design geographical and intended to illustrate a geographical conception, and other pictures should be artistic so that any geographical feature which they may possess is accidental, as it were, to the subject which the artist has chosen.

Finally there should be a lantern and a nest of slides. The lantern should with its appurtenances be the best which the teacher can persuade his authority to supply, for the essential feature of a lantern in geographical work lies in its readiness for immediate and unexpected use.

Although there can be no doubt that children regard the picture thrown upon a screen with more attention than a picture on paper or canvas, it is important that the pupils should be prepared to take the pictures shown on the lantern screen as ordinary affairs for ordinary use.

This attitude is not possible if the pupils are required to go to a special room and are only shown sets of slides at a time, it is better to be ready to show one or two slides, when they are necessary to the argument, and to occupy but five or ten minutes in so doing rather than to save up the slides which illustrate the points raised until there are about twenty of them and then to give a special lantern lesson on those twenty slides.

From this it follows that the school stock of geographical slides will be a personal matter for the teacher of geography they will consist in those slides which he has chosen because they suit his work and his scheme, or because they represent areas which he knows personally.

The slides should be carefully arranged in a nest of drawers so that he can lay his hand on any particular slide in a moment, and so that he can use any particular slide just when he desires. It therefore follows that the slides should be the property of the school and not the property of a group of schools, and that as a general rule they should not leave the school building on loan.

The personal element in connection with the school-stock of slides will be immensely increased if the teacher can obtain and use an apparatus for making lantern slides. His pupils will readily bring him pictures which they have collected and from these he can make slides for school use; and since the pupils will as a rule be able to supply the personal acquaintance with the district illustrated he will be able to speak more definitely about the geographical feature which the picture illustrates. If there be a Camera Club in connection with the school it will be possible not only for him to train his pupils in the manufacture of lantern slides, but it will be possible for him to obtain valuable assistance in the mechanical processes such as covering and binding, labelling and classifying his lantern slides when they have been made. The school gains greatly when its stock of geographical pictures is due to its own endeavours.

What has been said above with reference to the slides applies with equal truth to the school store of specimens in the museum. Pupils should be encouraged to bring specimens of a geographical nature for the museum, and the specimens should be labelled in such a way as to retain the personal element which prevails in the collection.

The geographical lending library may justly be regarded as a part of the apparatus used in teaching geography. The teacher should obtain books which supply first hand information about any matter of geographical importance, descriptions of foreign lands, descriptions of commercial products and processes, standard works on geographical science, reference books such as gazetteers, and larger atlases. He should divide these books into groups according to their suitability for pupils of the various ages. One group of purely reference books will never be lent but each other group should be for the use of boys in a certain form and should be placed in charge of a form librarian, whose business it is to see that the books are in circulation and to return books which are not required in his form.

Blue Books. The school should acquire by degrees a stock of British and foreign government publications, and particular attention should be paid to the books issued by the governments of the Colonies and the United States. In some cases six or more copies of these books are required, e.g. the Annual Reports of the Board of Agriculture, the reports of the New Zealand government on agriculture. The pupils will then be able to verify the facts contained in their text-books and they will receive some training in the acquisition of quantitative information at first hand.

CHAPTER XXI

CORRELATION

Modern education a geographical fact. The changes which have been made in the curriculum of schools are of such intrinsic importance that, as a general rule, they have not been regarded as a more or less organic response by modern society to the new features of man's environment. In the kaleidoscopic nature of the material world certain conditions achieve prominence and importance during a given period of history and education tends to respond to these new situations as they rise. Since geographical studies are very closely related to the main elements of the material world, the geographical response is probably quicker than that of any other subject, hence it follows that geography is a fundamental constituent of the curriculum of modern schools whether these schools are essentially or only partially "commercial" in their bias. Geography should, therefore, be closely correlated with other subjects and the closeness of such correlation should aim at giving breadth to the geographical education and depth to other studies

Geography and the mother tongue. Geographical work provides many opportunities for exercises in writing English and in so far as he is able the teacher of geography should insist upon clear, concise and precise English in his note-books; he will have innumerable opportunities for improving the English work of his pupils during the time he devotes, *with* each pupil, to the examination of the written work of the transition stage. It will be found, at a later stage, that the pupils require help in writing connected accounts of geographical arguments and for this purpose it will be useful during the first year of the argumentative stage to give a series of lectures at which the pupils take notes from which a written account of the lecture is later produced. The teacher of English should be stimulated to make as much use of geographical facts and descriptions as of historical themes as a vehicle for training the child's power in composition.

Further, the teacher of geography should make use of extracts of English as a vehicle for geographical training: there are many pieces of beautiful prose which deal entirely with a geographical subject and the teacher of geography will find the consideration of such passages from a geographical point of view a useful and welcome variation from the usual routine. In this connection, it may be suggested that neither the school hymn book nor the Old Testament should be neglected ; in both cases, a mirror is held up to a certain aspect of human life which depends upon environment.

Geography and mathematics. In matters arithmetical it has become a truism that the problems which are placed before the pupil should bear some relation to the life which he leads, both in and out of school. Hence, even in the mere matters of multiplication and division, in the use of decimals and the metric system, geography provides a great range of subject matter for arithmetical work of which the correct results might easily be recorded instead of being consigned to the oblivion which awaits useless things. Every teacher of arithmetic provides his pupils with a certain amount of drill, and if he were to take his drill from the data which are used in geography, it would be useful to the geography pupil and would provide him with most of the material which he would need. In the content of later arithmetic there are many matters which call for geographical explanation. It is not suggested that all the material for arithmetical computation should be geographical, but it is suggested that a large amount of the time which is spent in making calculations which are useless when completed, because their results are of little practical importance, should be better occupied in making calculations of which the results have an intrinsic value.

In matters algebraical, once the stage of generalised arithmetic is passed, there remains the stage at which graphical methods are employed.

Here the work has geographical value and some at least of the examples might be definitely related to the necessities of the geographical work. The work in graphics might even be carried a stage farther than is sometimes usual, and the pupil might be led to the geographical solution of problems to which at the moment his algebraic equipment does not then lead to a solution: such work would be useful geographically.

The purpose and practical importance of geometry as the science of surveying might be introduced to the pupils in relation to the similarity of triangles and in relation to the standard trigonometrical ratios, in particular to the cosine and the tangent.

Abstract geometry is rapidly being displaced in school work by a conception of geometry as a tool which may be used to perform certain operations because it is a statement of scientific truth. The formal deductive treatment of the subject is being discarded in favour of more experimental work, and in this connection geography will supply much of the material which is a justification for the change. The theoretical considerations which lie behind the best cartography and surveying can be so arranged as to produce a course of study in geometry which would have both a high intrinsic value and a great utility. In this connection, it may be wise to suggest that the proper place for what is called mathematical geography, for that part of geography which overlaps with astronomy, is in connection with the teaching of the higher branches of mathematics; where also occurs the place for the preliminary treatment of statistical methods without which the geographer is not fully equipped for modern geographical inquiry. It is not suggested here that the geographical content of mathematics is the only content, there is much need for a stronger correlation between mathematics and the study of physical science, and such studies would necessarily react upon the geographical work, since so much of the development of modern times depends upon the application of the truths and discoveries of physical science to the needs of man in his life on, and conquest of, the earth which forms his environment.

Geography and history. The relation between geography and history has been considered in a previous chapter. It will be sufficient to repeat here that the main modification which would occur in a school where the correlation between the two subjects was made as complete as possible, would be in the direction of altering, during the early years, the emphasis which was laid upon certain areas of the earth's surface, particularly in the case of the Mediterranean, so that whenever the child reached the study of the detailed history of an area there was always ready for use the geographical back-ground due to the static factors in the environment of the people who dwelt in the land. At the same time the work in history would have to be modified so as to take into account the dynamic factors in the environment of each country, in much the same way as the dynamic factors influence the teaching of English in the higher forms The main value of history lies in its account of the development of institutions and in so far as this development mirrors the environment of the race the teacher of history would necessarily give to his work a distinctly geographical flavour.

Pictures used in teaching and geography. The direct method of teaching modern languages is based upon the use of a set of pictures which in themselves are somewhat inappropriate for children who live in English towns: it would be easily possible to provide similar pictures in which the geographical content, the geographical element which caused the picture to mirror the life of people in the foreign land, was much greater and much more definite and closely related to the actual life of the people than is the case in the pictures now in use. Instead of the scenes which deal with the life on the land, it would perhaps be better to dwell upon matters more closely related to the life and occupations of the majority of the people, with whose life the English children were acquainted. The correlation between geography and modern language teaching could be made closer in this way and such work could be supplemented by the use in the language lessons of the lantern slides which are originally prepared for the geographical lesson on the particular foreign country of which the language is studied. France and Germany could in this way become much more real to the pupils, if the relations between geography and these languages were consciously made closer by means of the co-operation of the teachers of the two subjects.

Geography and science. In regard to science there has been so much correlation in some schools in the past that it happens sometimes that the teacher of science is also the teacher of geography. Such a teacher, with usually a training in science and a subsequent study of geography tends to over-emphasise the scientific aspect of certain geographical matters, and to dwell too closely upon the causal relation which is expressed as a sequence of action and reaction rather than upon the causal relation which is the great type of geographical conditions and which depends upon the interaction of various controls. Despite this tendency it happens however that there is great scope for correlation between science teaching in schools and geographical work. In chemistry, the moment the observational work is past the geographical nature of the content studied becomes more and more important and the final work of a geographical nature should lie in what may be called the chemistry of industry or the chemistry of business, where the main purpose of the work would lie in laying bare man's conquest of nature and man's application of his hard-earned knowledge to the satisfaction of his needs, and this conception is entirely geographical in its bearing. Given, then, so much of common ground the two teachers should be able to work out a course of instruction which would result in benefit to both of them as teachers and be of great utility to their pupils.

In physics, similarly, in addition to all the theoretical work which is related to the geographical study of climate, there arises also the possibility of work on the physics of industry and commerce, which would be essentially geographical in its nature and content.

As regards botany and nature study the geographical aspect of these studies is so obvious that there is little need to do more than mention the fact.

Geography and art. Mention has been made in previous pages of the correlation which may normally occur between geography and art. Much of the work in clay modelling is in one sense artistic since it is related to the production of a solid presentation which bears a certain resemblance to something real. That this presentation is to some degree the result of measurement is in itself no drawback at the stage of life when the work is performed and there is certainly some feeling for proportion required when the pupil essays the task of filling in the surface slopes on his stepped model.

Early work in colour presentations of reality may just as well be exercised upon teacher's copies made from the geographer's photographs as from imagined pictures : and the discussion of the real country which follows the attempt at its portrayal in the art room is beneficial both to subsequent work in art and to the acquisition of geographical notions.

Later, when the pupils have reached the stage of greater facility with the pencil it is possible to set them the task of drawing from a contoured map a picture of the scene as they imagine it : such early efforts may be the result of much measurement of the map, but in time the pupil should be able to make a drawing which represents the reality with fair accuracy, without making many map measurements.

Geography and economics. Finally there occurs the relation between geography and the science of economics which is gradually finding its way into certain schools. Much of the work at present done in economics is too abstract, too theoretical : for pupils still in school there is great need for descriptive work in economics and such work is by its very nature closely related to geography,—in fact, much early work in geography may be regarded as a preparation for the study of descriptive economics. At a later stage economic study involves reference to statistical methods of inquiry and the quantitative work in the geography course may be regarded almost as a series of lessons in the elements of statistical method.

The position of geographical studies. At one time the handmaid of other subjects, at another the immediate justification for a course of study in another department of the School, at a third time the crowning conception which gives unity and force to a definite course of instruction, and yet again proceeding step by step along a parallel path of instruction, geography has earned a place in the curriculum of modern schools.

At all ages the geographical studies of the pupil bear some relation to some other subject of study, and no pupil, whatever his bias, can fail to gain something of value from his geographical work. The responsibility for correlation rests upon the teacher of geography. He may persuade his colleagues to give assistance to the ideal of education as an organised whole, yet he should know intimately what his colleagues are doing and should be ready at the appropriate time to provide the geographical stimulus which tends to give cohesion to the masses of information and the processes of learning which pupils are too ready to regard as separate and distinct, and too prone to associate as local to a particular teacher and a particular class-room. His subject is comprehensive and the wide outlook depends largely upon his work.

CHAPTER XXII

THE SCIENCE OF GEOGRAPHY. A HUMAN SCIENCE

Both the practical and the theoretical suggestions which have been made in the preceding chapters of this book are based to a large degree upon actual teaching experience, and this teaching experience has been obtained under the guidance of a conception of the science of geography which is implicit in the preceding chapters and which should now be made explicit.

Geography is a human science and its generalisations and its methods of inquiry are more nearly related to those which are utilised in the kindred sciences of economics and sociology than to those which are in vogue in connection with physical science.

Consequently, the generalisations of geography are not usually subject to control experiments nor to demonstration experiments such as are useful in the teaching of physical science.

Geographical generalisations partake more largely of the nature of co-existences than of the nature of sequences; there is more attention, therefore, necessary to the interaction of various controlling factors which modify each other than to the gradual development of an argument based upon cause and consequence such as is most clearly displayed in the teaching of deductive geometry.

The teacher uses as a working hypothesis, from the first initiation of the pupil to geographical thought, the dictum that man's life and labours are conditioned by his environment, and the whole course of geographical teaching should aim at demonstrating from as many points of view as possible the truth of this working hypothesis. Consequently, the teacher should take care to cover the whole ground of man's life and labours, although at the same time he elaborates his hypothesis more definitely in relation to the work of those men who lead lives of general usefulness to their fellows than to those men whose lives are passed in a narrow circle of self-centred sufficiency. He treats of the life of the steppe dweller or of the Eskimo but briefly, while he treats of the life of the worker on the prairie or in the factory at greater length. He may develop the hypothesis that somewhere in the world to-day there live people whose lives are similar, because they are governed by a similar environment, to the lives of all the peoples whose development makes up the historical narrative, but he harks back to the generalisation that only those peoples who pass their lives in approximately the highest state of civilisation are worthy of detailed study and painstaking examination.

In regard to the environment of the men of to-day he pays attention to relief and climate, to the natural vegetation which they control, but the main emphasis of the story lies not in the control which is effected by these static factors, but in the progress which is the result of human effort to free man from the shackles of the environment which tends to limit his activities: the main emphasis therefore tends to fall upon the dynamic factors in the life of man, and the greatest of these factors is the work of man himself.

It must ever be remembered, while man is the subject of study, that he reacts on his environment, and since humanity is capricious and human judgment is liable to error it is not always possible to explain geographical facts in general terms.

This conception of the importance of the dynamic factors in the life of man is summarised in the phrase "man's conquest of nature," and is the main reason why geography tends to be a subject apart from history, and apart from physical science, with an essential unity of its own.

Now the investigation of both the static and the dynamic factors must proceed upon the lines which are usual in the development of scientific knowledge: the student must consider specific cases and must generalise therefrom: and his generalisations may be the result of a close examination into the factors which combine to produce a certain result, i.e. it may be intensive, and may show the necessary conditions which govern certain sets of circumstances: or the generalisation may follow from an extensive survey of the manifestations of the given geographical circumstance in all parts of the world. For example, the factors which serve to control the manufacture of cotton goods in a certain place to the exclusion of other neighbouring places may be determined from a close investigation into the conditions which prevail in the area where these conditions occur at their best, i.e. in South Lancashire, whereas the production of wheat for the world's consumption occurs in so varied climes and amid such varied conditions that the investigation must be extensive and the general conditions which determine the cultivation of wheat may be laid down in a different way from those which govern cotton manufactures. But no matter how the investigation may be made the final expression of the controlling factors must be in terms of human endeavour.

The appraisement of the result of human endeavour for geographical purposes is as a rule impossible directly, for direct data are not available: consequently the student must be trained with reference to the estimation, from the data which are collected and available, of the value of the human effort which lies behind the facts usually enumerated.

The student of geography has therefore to translate facts regarding commodities into facts regarding men, to refer facts regarding the separate climatic regions into facts concerning the inhabitants of those regions: he has to account for the presence in certain places of men who by nature are unsuited to the life they lead, and for the consequences of their presence.

Scientific thought implies outlook, inlook and sidelook,—outlook over the whole of the conditions which may operate and therefore the estimation of relative importance and the selection of those facts which matter from those facts which are comparatively trivial; inlook into the details of the case, so that generalisations may not be superficial, may not be the statement of connection which are due merely to accidental contiguity in time or space; and sidelook over all the related circumstances so that generalisations may be tested and checked.

Scientific thought also implies habits of measurement, and the statement of results in some quantitative form, so that the student must be ready to infer from numerical data the numerical facts concerning the work of men. These numerical facts are of surpassing importance in relation to the comparisons which the student must necessarily make.

The acquisition of topographical knowledge as such and for its own sake cannot be regarded as an essential feature either of geographical teaching or of geographical study; provided the pupil knows how to obtain topographical information, the teacher of geography has done his part.

In the same way, it is not important in the teaching of geography that the pupil should acquire information about the resources of a country unless those resources affect human endeavour to a marked degree. It may be assumed that where a sea contains fish which are edible and saleable, there some men will be fishers; unless those fishers are numerous or contribute largely to the food supplies of many people at a distance, those people are relatively unimportant in school geography.

The fact that there are fishermen at a place *X* may be useful and important in a detailed survey of the parochial affairs of a small area, in a case where the minute particulars of a small region are studied to emphasise the fact that geographical controls operate both in the mass and on the small scale, both for the world as a whole or for the country at large or for the group of several parishes; but the fact has little importance to the main geographical thesis unless the concentric rings of its dynamic effects are sufficiently wide-spreading to modify the lives of many other men.

Similarly, it is a matter of slight importance that there are deposits of iron ore in New Zealand, or that in the New Zealand towns there are some people occupied in manufacturing clothing, etc. These facts are of little value for the rest of the world at the moment and they affect the lives of others but slightly.

So in the case of the location of towns; it may be assumed as a working hypothesis that wherever a large river flows through a region containing relatively many people there will be towns at the place where the river can be bridged nearest to the sea, at the junctions of river and tributary, at convenient fording places, and at places where roads cross the river track. The assumption may be accepted as a working hypothesis and may be readily verified; but the generalisation when obtained is of little value, since it is but a particular case of the general statement that whenever man needs to surmount a natural obstacle he tends to do so.

It is perfectly true that some bridge towns are of great importance, but their importance is not due to their being bridge towns: the fact that they are bridge towns merely modifies their local situation: the factors which have given the town importance lie far beyond the city walls and the immediate locality: as stated on a previous page the importance of New York steadily increases as the value of the control of the situation of New York by the Hudson-Mohawk depression decreases.

The science of geography relates to the circumstances of the most wonderful happenings which have yet taken place in the world: the story of the rise of the steam engine and its application to the driving of machinery of trains is in itself a story of wonderful fascination, but the story of geography, mirroring as it does the results which this single invention has produced throughout the civilised world, gradually unfolds itself to the pupil in the geography class-room as a much more wonderful and fascinating story still—the progress of the average man, who, in face of difficulties set before him, by nature, by governments, by the errors of his fellow men, has attained to the present stage of world conquest, has dominated to so great a degree the environment in which he passes his life. He dominates now by towering over the obstacle, now by making arrangements to lessen the inevitable shock, he invents, he foresees, but he conquers in the long run.

The story of geography is the story of the triumph of the average man.

ADDENDA

p. 39. The Mongolian races are excluded from consideration in the antithesis between the Caucasian and the indigenous races; the latter term includes peoples such as the pigmies, lapps, kaffirs.

p. 50. The suggestion that a knowledge of unworked mineral deposits should not be included in a school geography course is emphasised here and elsewhere. It has been objected that such a course is incompatible with the suggestion that pupils should be taught something regarding the possibilities of unfarmed areas as potential wheat producers. Such an objection misses the whole point of the argument; mineral deposits are accidental to the conception of the world as the source of raw materials for human use, and unworked mineral deposits, at present, do not "control" human activities; on the other hand, wheat areas are essentially component parts of the chain of argument which begins with sun heat and ends with a man's meal; consequently, wheat areas occur or may occur where certain climatic and vegetative conditions co-exist; hence the consideration both of these areas which are productive and of those which await development provides the teacher with a means of emphasising, by contrast, the lesson he desires to convey to his pupils. It is the business of the teacher of geography to limit the number of isolated and accidental facts which he expects his pupils to learn.

p. 152. Teachers who desire to purchase models should write to the Director of the National Museum of Wales, Cardiff, for the *Descriptive Handbook of the Relief Model of Wales* (price 6*d.*) in order to obtain particulars of models of Snowdon and Nantwich districts which form a useful contrast.

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